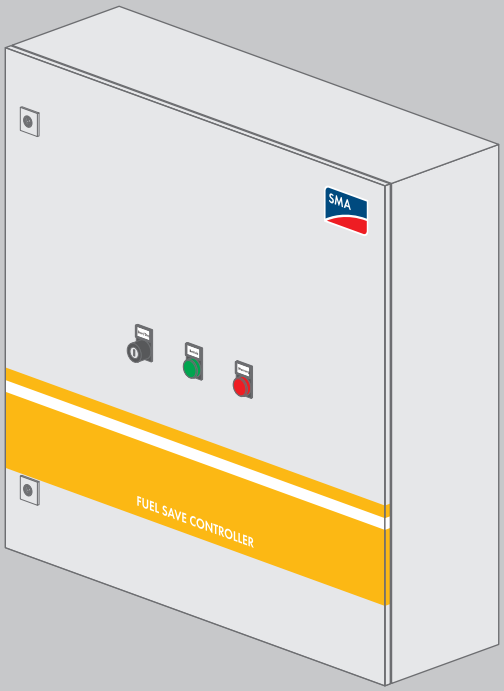
User Manual

SMA FUEL SAVE CONTROLLER 2.0M



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1 Information on this Document

1.1 Validity

This document is valid for the device type "FSC-20M" (SMA Fuel Save Controller 2.0M).

1.2 Target group

The tasks described in this document must only be performed by qualified persons. Qualified persons must have the following skills:

- Training in how to deal with the dangers and risks associated with installing and using electrical devices and installations
- Training in the installation and commissioning of electrical devices and installations
- Knowledge of all applicable standards and directives
- Knowledge of how the SMA Fuel Save Controller works and is operated
- Knowledge of and compliance with this document and all safety information

1.3 Symbols

Symbol	Explanation
⚠ DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury
⚠ WARNING	Indicates a hazardous situation which, if not avoided, can result in death or serious injury
⚠ CAUTION	Indicates a hazardous situation which, if not avoided, can result in minor or moderate injury
NOTICE	Indicates a situation which, if not avoided, can result in property damage
i	Information that is important for a specific topic or goal, but is not safety-relevant
☐	Indicates a requirement for meeting a specific goal
☑	Desired result
✖	A problem that might occur

1.4 Typographies

Typography	Use	Example
bold	• Display messages • Parameters • Terminals • Slots • Elements to be selected • Elements to be entered	• Connect the insulated conductors to the terminals **X703:1** to **X703:6**. • In the **Select language** drop-down list, select the desired language.

Typography	Use	Example
>	• Several elements that are to be selected	• Open the dialog box **Change Password** via the following path **Settings > Change Password**.
[**Button**] [**Key**]	• Button that is to be selected or clicked on	• Press the button [**Change my Password**].

1.5 Nomenclature

Complete designation	Designation in this document
SMA Fuel Save Controller 2.0M	Fuel Save Controller
Sunny Tripower	Inverter
Electric generator with combustion engine	Genset

2 Safety

2.1 Intended Use

Together with SMA inverters, the SMA Fuel Save Controller is a system solution for the installation of photovoltaic diesel hybrid systems through the integration of PV power plants into local utility grids based on gensets. The SMA Fuel Save Controller monitors and controls the SMA PV inverters and allows stable operation of the photovoltaic diesel hybrid system. To ensure this, the SMA Fuel Save Controller continuously monitors the operating state of the gensets and loads and adjusts the output power of the SMA inverters accordingly, where necessary.

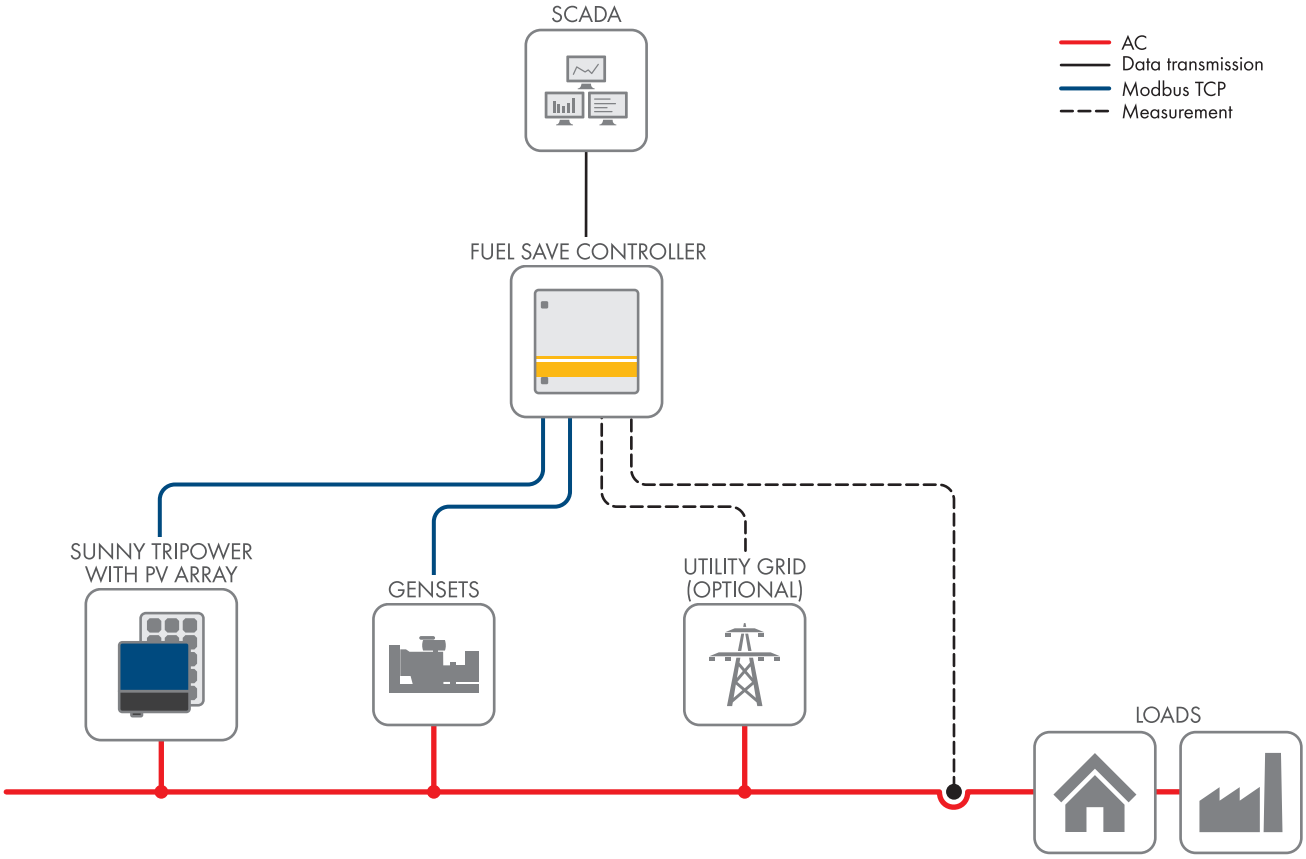

Figure 1: Regulation principle of PV systems with Fuel Save Controller

Gensets used in conjunction with the Fuel Save Controller must fulfill the reverse power limits of the Fuel Save Controller (see installation manual of the Fuel Save Controller).

The power management and the communication interface of the gensets must be compatible with the Fuel Save Controller for optimal operation of the photovoltaic diesel hybrid system. Therefore, the combined use of the Fuel Save Controller and the gensets must be coordinated with SMA Solar Technology AG (see Technical Information "Gensets in photovoltaic diesel hybrid systems with SMA Fuel Save Controller 2.0M").

The SMA Fuel Save Controller has a Modbus/TCP interface for communicating with peripheral devices. Ensure that all communication between the SMA Fuel Save Controller and the gensets takes place via either the Modbus/TCP interface or the CAN interface.

The product is suitable for indoor and outdoor use.

Use this product only in accordance with the information provided in the enclosed documentation and with the locally applicable standards and directives. Any other application may cause personal injury or property damage.

Alterations to the product, e.g. changes or modifications, are only permitted with the express written permission of SMA Solar Technology AG. Unauthorized alterations will void guarantee and warranty claims and in most cases terminate the operating license. SMA Solar Technology AG shall not be held liable for any damage caused by such changes.

Any use of the product other than that described in the Intended Use section does not qualify as appropriate.

The enclosed documentation is an integral part of this product. Keep the documentation in a convenient place for future reference and observe all instructions contained therein.

Suitable personal protective equipment has to be worn by all persons working on or with the product.

The type label must remain permanently attached to the product.

2.2 Safety Information

This section contains safety information that must be observed at all times when working on or with the product.

To prevent personal injury and property damage and to ensure long-term operation of the product, read this section carefully and observe all safety information at all times.

⚠ WARNING

Danger to life from electric shock due to live voltage

Danger of electric shock if work is executed incorrectly or under fault conditions. An electric shock can lead to death or serious injury.

- Disconnect the supply voltage and the measuring cables for the current- and voltage measurement before performing any work on the Fuel Save Controller.
- Observe the five safety rules when disconnecting the supply voltage:
  - Disconnect from voltage sources.
  - Ensure that the device cannot be reconnected.
  - Ensure that no voltage is present.
  - Ground and short-circuit the device.
  - Cover and isolate any adjacent live components.

NOTICE

Damage to the PV power plant, gensets or loads due to unauthorized access

Parameters of the Fuel Save Controller can be set incorrectly due to unauthorized access. When parameters are set incorrectly, technical thresholds are being exceeded. An exceeding of technical thresholds can lead to damage of the PV power plant, gensets or loads.

- Protect the Fuel Save Controller from unauthorized access.
- Remove the key from the door locks and from the key switch.
- Store the keys in a safe place.
- Ensure that only qualified persons are able to set parameters on the Fuel Save Controller.
- Ensure that access via port forwarding from the external network to the router is deactivated in the Fuel Save Controller.

NOTICE

Property damage due to dust intrusion and moisture penetration

Dust intrusion or moisture penetration can damage the Fuel Save Controller.

- Protect the Fuel Save Controller against dust and moisture.
- Do not open the Fuel Save Controller at high humidity or high dust levels.
- Close the enclosure after performing any work on the Fuel Save Controller.

3 Product Description

3.1 Functions

Together with SMA inverters, the SMA Fuel Save Controller is a system solution for the installation of photovoltaic diesel hybrid systems through the integration of PV power plants into local utility grids based on gensets. The SMA Fuel Save Controller monitors and controls the SMA PV inverters and allows stable operation of the photovoltaic diesel hybrid system. To ensure this, the SMA Fuel Save Controller continuously monitors the operating state of the gensets and loads and adjusts the output power of the SMA inverters accordingly, where necessary.

The Fuel Save Controller performs the following tasks:

- Monitoring the power and operating state of the gensets
- Monitoring the loads and state of the local grid
- Calculating suitable values for the maximum power of the inverters according to defined parameter settings and the current status of gensets and loads
- Control and communication interface to the inverters
- Internal logging of all relevant system data (e.g. for local and remote monitoring)
- Emergency shutdown of the PV inverters under fault conditions in the photovoltaic diesel hybrid system

The basic configuration enables communication with one higher-level genset control system and inverters of the Sunny Tripower series. Further devices can be installed in consultation with SMA Solar Technology AG. To ensure system stability at all times, the Fuel Save Controller uses Modbus/TCP or CAN to monitor whether the gensets are connected to the local utility grid and what level of active power and reactive power the gensets are feeding into the grid.

The Fuel Save Controller is equipped with a Modbus/TCP interface for local and remote monitoring as well as for the communication with peripheral devices.. Depending on the configuration, it is possible to communicate with the following peripheral devices:

- A higher-level control system with up to eight gensets
- Controllers for up to eight gensets

  The power management and the communication interface of the gensets must be compatible with the Fuel Save Controller for optimal operation of the photovoltaic diesel hybrid system. Therefore, the combined use of the SMA Fuel Save Controller and the gensets must be coordinated with SMA Solar Technology AG (see Technical Information "Gensets in photovoltaic diesel hybrid systems with SMA Fuel Save Controller 2.0M").
- up to 64 inverters
- a remote monitoring system (SCADA or user interface / FTP)

The SMA Fuel Save Controller is also equipped with a CAN interface for communicating with up to eight gensets. Ensure that all communication between the SMA Fuel Save Controller and the gensets takes place via either the Modbus/TCP interface or the CAN interface. The Fuel Save Controller is not designed to communicate with gensets via the Modbus/TCP interface and CAN interface at the same time.

In combination with the system specifications defined during commissioning and the data from the load measurements and grid analyses, the Fuel Save Controller calculates power values for active power and reactive power suitable for the inverters. The power values are transmitted as setpoints to the PV inverters.

For local and remote monitoring, the SMA Fuel Save Controller logs data on the power and operating state of the inverters and the loads, and the power and operating state of the gensets. The logged data is saved in CSV format for 100 days and can be accessed via the integrated FTP server.

The Fuel Save Controller is equipped with up to three internal measurement modules. Each measuring module has one measuring system for voltage measurement and two measuring systems for current measurement. All measuring systems records the measuring values via three conductors. During network analysis, the Fuel Save Controller uses the measured values.

During commissioning of the Fuel Save Controller, the user has the possibility to activate various functions for stable and reliable operation such as minimum genset loading and power control range. In addition, it is possible to remotely monitor all relevant measurement data, process data and the current system status by means of SCADA or a web-based interface.

3.2 Structure

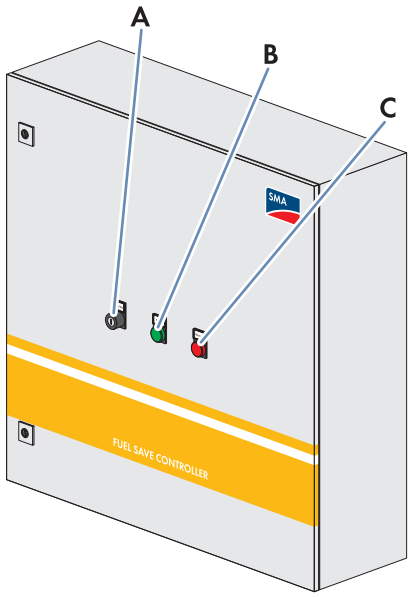

Figure 2: Fuel Save Controller

Position	Designation
A	Key switch
B	**Operation** light repeater
C	**Warning** light repeater

3.3 Key Switch

Position	Description
Start	The Fuel Save Controller can be started via the **Start** position.
Stop	Before the Fuel Save Controller can be stopped, ensure that the the current reserve power of the gensets is sufficient for supplying the power required by the loads. Genset overload may result in destruction of the gensets (see Section 10.1 "Stopping the SMA Fuel Save Controller and PV Power Plant", page 65). The Fuel Save Controller can be stopped **Stop**position.

3.4 Light Repeaters

The **Operation** und **Warning** light repeaters indicate the current status of the Fuel Save Controller.

Operation light repeater	Warning light repeater	Operating state	Description
Both light repeater are flashing alternately.		BOOT	The SMA Fuel Save Controller is starting.
		INIT	The Fuel Save Controller establishes the communication to the other devices in photovoltaic diesel hybrid system.
Flashing every 1 seconds	Off	STANDBY	The SMA Fuel Save Controller is in standby mode.
Flashing every 0.5 seconds	Off	MANUAL	The SMA Fuel Save Controller is in manual mode. The setpoint values for the active and reactive power of the PV power plant are set via the user interface of the Fuel Save Controller.
glowing	Off	OPERATE	The SMA Fuel Save Controller is in automatic mode and specifies the setpoints for the active and reactive power of the PV power plant. If the Fuel Save Controller is connected to a SCADA system, it will use the setpoints from the SCADA system in automatic mode.
glowing	Flashing every 1 seconds	SAFETY	The SMA Fuel Save Controller has switched to a safe state following an error. The PV power can be reduced compared with operation in automatic mode.
Off	glowing	ERROR	An error has occurred in the SMA Fuel Save Controller. Automatic operation of the PV diesel hybrid system is interrupted.
Off	Flashing every 0.5 seconds	PERMOFF	An error has occurred which require a stop and restart of the system.

3.5 Type Label

The type label clearly identifies the product. The type label is located on the right-hand side of the enclosure. You will find the following information on the type label:

- Device type (Type)
- Serial number (Serial No.)

You will require the information on the type label to use the product safely and when seeking customer support from Service (see Section 12 "Contact", page 68).

Symbols on the Type Label

Symbol	Explanation
	Danger to life due to electric shock The product operates at high voltages. All work on the product must be carried out by qualified persons only.

Symbol	Explanation
	Beware of a danger zone This warning symbol indicates a danger zone. Be particularly vigilant and cautious when working on the product.
	Observe the documentation Observe all documentation supplied with the product.
	WEEE designation Do not dispose of the product together with the household waste but in accordance with the disposal regulations for electronic waste applicable at the installation site.
CE	CE marking The product complies with the requirements of the applicable EU directives.

4 User Interface

4.1 Requirements for the user interface display

☐ A computer for displaying the user interface must be available.

☐ The computer must be connected to the SMA Fuel Save Controller via Ethernet.

☐ A web browser must be installed on the computer.

☐ JavaScript must be enabled in the web browser.

☐ The Java Runtime Environment software (version 6 or higher) must be installed on the computer.

☐ The IP address of the SMA Fuel Save Controller set during commissioning must be known.

Supported web browsers:

- Microsoft Internet Explorer from version 9
- Google Chrome from version 40

Display resolution:

- Minimum: 800 pixels x 600 pixels
- Recommended: from 1,024 pixels x 768 pixels

4.2 User Groups and User Rights

The SMA Fuel Save Controller distinguishes between the user groups **User** and **Installer**.

User rights	User group	
	User	Installer
Retrieve values of the PV diesel hybrid system and its subsystems, e.g. the gensets, the PV power plant or the load controller (see Section 6 "System Monitoring", page 24)	✓	✓
Set parameters of the PV diesel hybrid system (see Section 7 "System Settings", page 37)	–	✓
Save, load and delete system settings (see Section 7, page 37)	–	✓
Set control functions of the PV diesel hybrid system and subsystems (see Section 8 "System Control", page 52)	–	✓
Retrieve data for acquisition of measured values (see Section 9 "System History", page 64)	✓	✓
Retrieve event and error messages (see Section 9 "System History", page 64)	–	✓

4.3 Requirements for a Secure System Password

The system password entered for your user group when you log into the Fuel Save Controller user interface for the first time is a default system password. For security reasons, you should change the default system password as soon as possible following commissioning (see Section 5.2, page 22).

You can increase the security of your system password with the following measures:

- Select system passwords containing at least eight characters.
- Use combinations of upper-case and lower-case letters, special characters and numbers.
- Do not use names or common words (e.g., "dog", "cat", "house").

- For the system password, avoid using words that have any personal relevance to you such as the names of persons or pets, personnel numbers, identification numbers or car license plates.
- Do not repeat names or words (e.g., "househouse" or "catcat").
- Do not use combinations of numbers or letters in the same order as they appear on your keyboard (e.g., "12345", "qwert").

4.4 Design of the User Interface

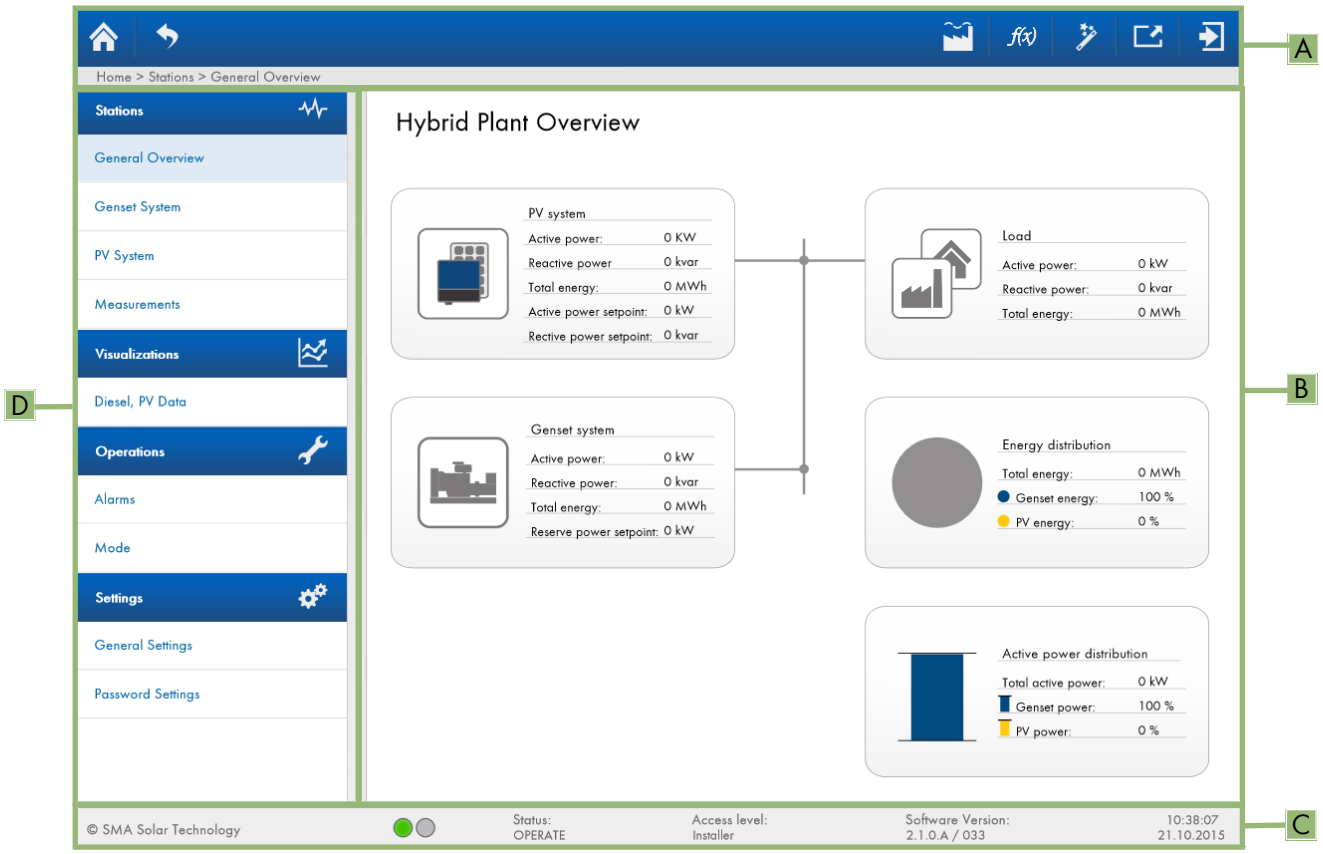

Figure 3: User interface of the Fuel Save Controller (example)

Position	Designation	Explanation
A	Header	Enables access to the main functions of the user interface (see Section 4.5 "Buttons in the header", page 15). Displays the current path (e.g., **Home > Stations Plant Overview**).
B	Content area	Depending on the selected page, display values, adjustable parameters or a combination of display values and adjustable parameters are shown in the content area. Additional buttons are available on individual pages.

Position	Designation	Explanation
C	Status bar	Displays the following information: • Graphical display of the operating state (see Section 3.4 "Light Repeaters", page 11) • **Status**: Operating state of the Fuel Save Controller: – **BOOT**: Fuel Save Controller is starting. – **INIT**: Fuel Save Controller is establishing communication with the other devices in the PV diesel hybrid system. – **STANDBY**: Fuel Save Controller is in standby mode. – **MANUAL**: Fuel Save Controller is in manual mode. The setpoint values for the active and reactive power of the PV power plant are set via the user interface. – **OPERATE**: Fuel Save Controller is in automatic mode and specifies the setpoints for the active and reactive power of the PV power plant. If the Fuel Save Controller is connected to a SCADA system, it will use the setpoints from the SCADA system in automatic mode. – **SAFETY**: The Fuel Save Controller has switched to a safe state following an error. The PV power can be reduced compared with operation in automatic mode. – **ERROR**: There is an error in the Fuel Save Controller. Automatic operation of the PV diesel hybrid system is interrupted. – **PERMOFF**: A serious error has occurred that can be rectified only by stopping and restarting the system. • **Access level**: User group that you are logged in with • **Software version**: Current software version of the Fuel Save Controller • Date and location
D	Page and menu selection	Access to the various pages and menus of the user interface

4.5 Buttons in the header

Symbol	Designation	Description
	Home	Use this symbol to access the home page.
	Return	Use this symbol to go back to the previous page.
	Plant*	Use this symbol to call up the **Hybrid Plant Overview** page. The **Hybrid Plant Overview** page shows an overview of the display values for the PV diesel hybrid system (see Section 6.1, page 24).
	Wizard*	Use this symbol to call up the configuration wizard and edit the system settings (see Section 7, page 37).
	Control *	Use this symbol to set various parameters relating to system control (see Section 8, page 52).

Symbol	Designation	Description
	Export*	Use this symbol to call up the following functions: • Save current system settings (see Section 7.6.1, page 49) • Load saved system settings (see Section 7.6.2, page 50) • Delete saved system settings (see Section 7.6.3, page 51)
	Logout	Use this symbol to log out of the system.

* To use this button you must be logged in as an **Installer**.

4.6 Home Page for User Group "User"

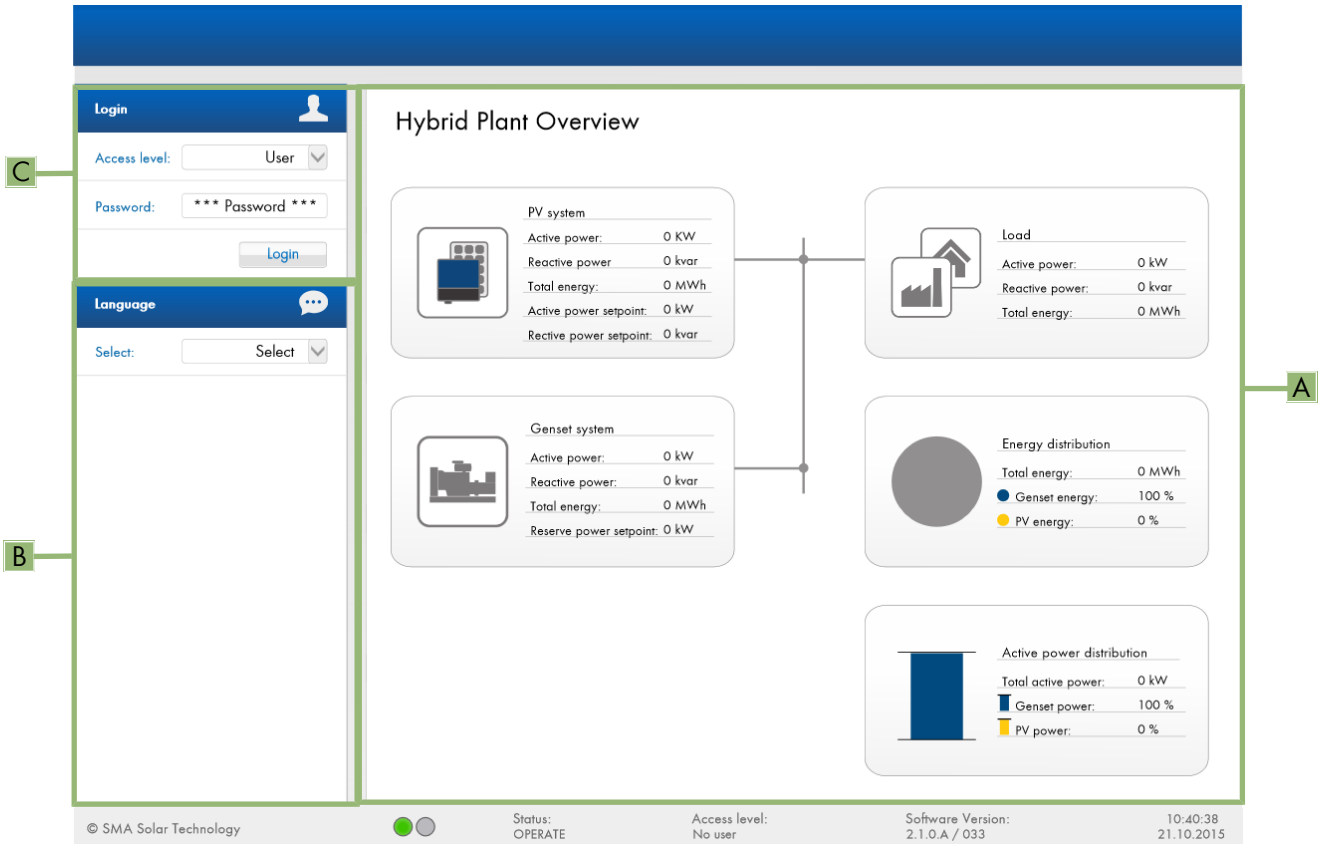

Figure 4: Home page for user group **User** (example)

Position	Designation	Explanation
A	Hybrid Plant Overview	Overview of all display values of the PV diesel hybrid system (see Section 6.1 "Retrieving Display Values of the Entire PV Diesel Hybrid System", page 24)
B	Language	Dialog box for setting the language of the user interface (see Section 5.4 "Setting the User Interface Language", page 22)
C	Login	Dialog box for logging into the user interface (see Section 5.1 "Logging In and Out of the User Interface", page 21)

4.7 Home Page for User Group "Installer"

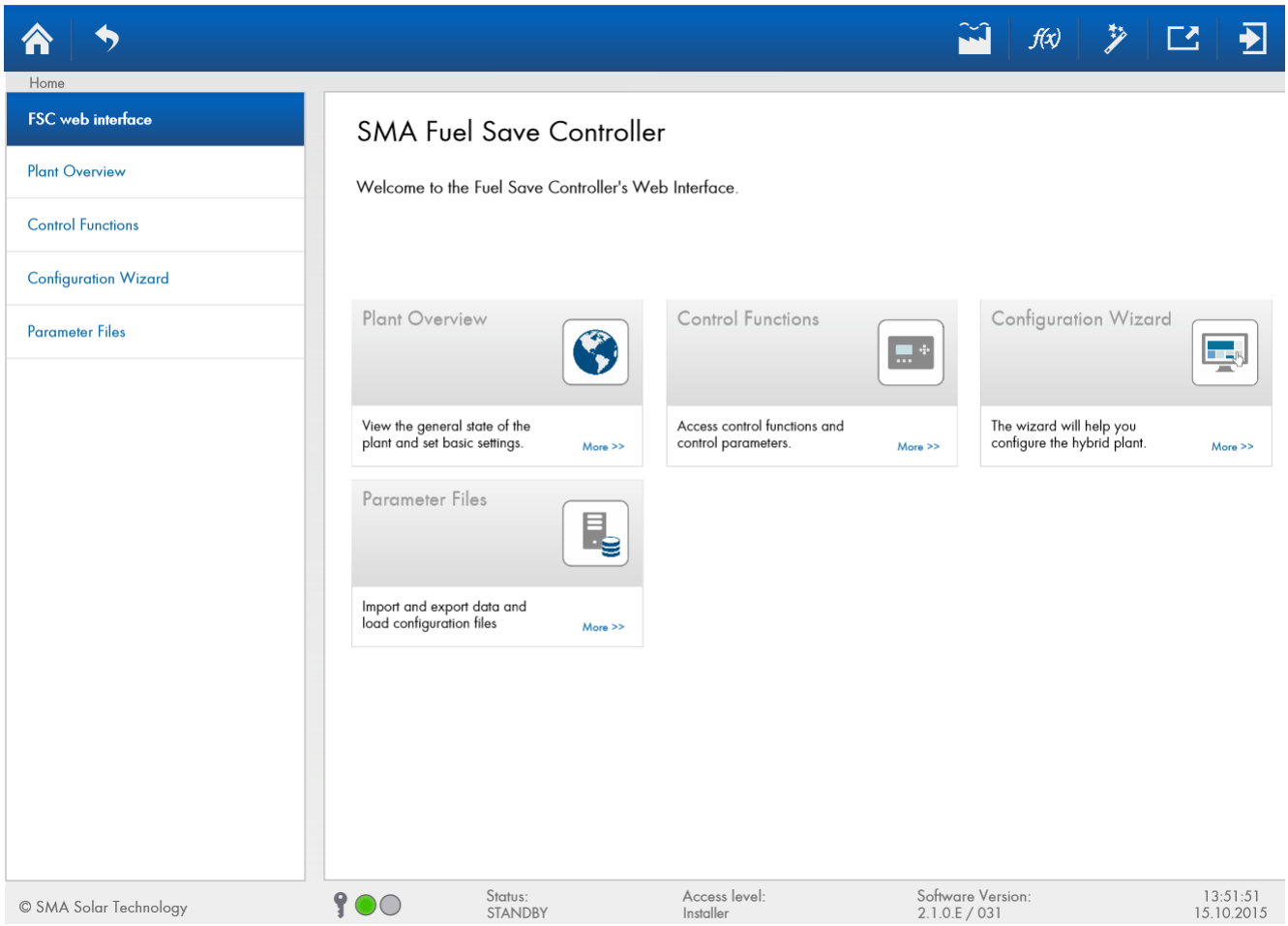

Figure 5: Home page for user group **Installer** (example)

Button	Description
Plant Overview	Access to system monitoring(see Section 6, page 24)
Control Functions	Access to system control (see Section 8, page 52)
Configuration Wizard	Access to system settings (see Section 7, page 37)
Parameter Files	Save current system settings and load/delete saved system settings (see Section 7.6, page 49)

4.8 Configuration Wizard

4.8.1 Structure of the Configuration Wizard

To use the configuration wizard you must be logged in as an **Installer**.

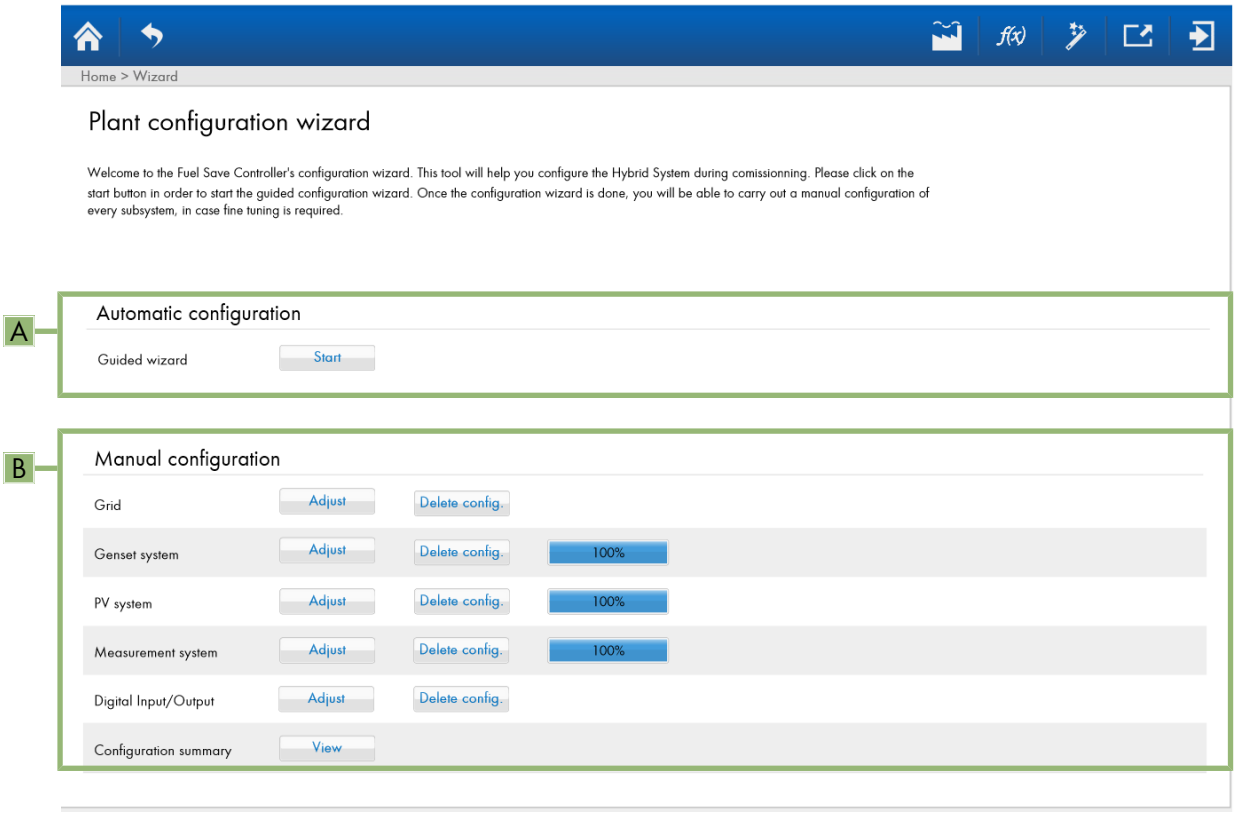

Figure 6: Home page of the configuration wizard (example)

Position	Designation	Explanation
A	Automatic configuration	The automatic configuration wizard guides you through the configuration of the entire PV diesel hybrid system. During initial commissioning of the PV diesel hybrid system the automatic configuration wizard must be run completely. In the **Manual configuration** area the completion status for each subsystem is displayed in %. Once the completion status has reached 100% for all subsystems, automatic configuration is completed.
B	Manual configuration	After initial commissioning, use the manual configuration wizard to carry out settings on individual subsystems: • Utility grid (see Section 7.1, page 37) • Gensets (see Section 7.2, page 37) • PV power plant (see Section 7.3, page 41) • Measurement devices (see Section 7.4, page 43) • Digital inputs and outputs (see Section 7.5, page 47) In addition, the manual configuration wizard provides an overview of the current system settings.

4.8.2 Buttons in the Configuration Wizard

To use the configuration wizard you must be logged in as an **Installer**.

Button	Description
Add new item	Add device type, e.g. a type of inverter

Button	Description
Adjust	Adjust configuration of a subsystem
Apply	Save system settings This saves all system settings in the active dialog. If you exit the active dialog without saving the system settings, any system settings made since the last save will be discarded.
Continue Wizard	Continue to the next dialog
Delete config.	Delete configuration of a subsystem
Discard	Discard system settings Any system settings made in the active dialog and not saved by pressing the **Apply** button will be discarded.
Done	Close the active dialog and switch to the overview of current system settings
Remove item	Remove device type, e.g. a type of inverter
Start	Start automatic configuration wizard
View	Show overview of current system settings

4.8.3 Setting Parameters

Setpoints for the Subsystems

Basically you should always proceed as follows to set the value of a parameter. Note the instructions for the separate subsystems according to the following table.

Subsystem	See
Utility grid	(see Section 7.1, page 37)
Gensets	(see Section 7.2, page 37)
PV power plant	(see Section 7.3, page 41)
Measurement devices	(see Section 7.4, page 43)
Digital inputs and outputs	(see Section 7.5, page 47)

Display of parameters with non-permitted values:

Symbol	Designation	Explanation
	Error symbol	If a parameter is set to a non-permitted value, it will be marked as invalid by this error symbol.

NOTICE

Risk of damage to devices by entry of incorrect parameters

Incorrect parameters may damage devices and result in system malfunctions in the PV diesel hybrid system. All adjustable parameters are protected by the password of the user group **Installer**.

- Only a qualified person is permitted to set and adjust parameters.
- Only give the password for the user group **Installer** to qualified persons.
- Change the default passwords as soon as possible.

Procedure:

1. Log in as **Installer** (see Section 5.1, page 21).
2. Select a menu via the page and menu selection.
3. Select desired parameter in the content area:
   - To change parameters with an entry field, enter new values and press Enter after each entry.
     By pressing Enter, the entered value is adopted in the user interface of the Fuel Save Controller.
   - To change parameters with a checkbox, activate the required checkbox.
   - To change parameters with a drop-down list, select the desired value in the appropriate drop-down list.
4. If the error symbol appears, check your entry and set the parameter to a valid value. To do this, repeat the previous step.
5. To adopt current parameter settings in the control of the Fuel Save Controller, press [**Apply**].
6. To discard current parameter settings, press [**Discard**].

5 Getting Started

5.1 Logging In and Out of the User Interface

Log in

User group	Default password
User	0000
Installer	1111

Requirements:

☐ The IP address of the Fuel Save Controller (defined during commissioning) and the subnet mask must be known.

☐ The computer used to display the user interface must have an IP address located in the same subnet as the IP address of the Fuel Save Controller.

Example:

If the IP address of the Fuel Save Controller has been set e.g. to **172.16.1.21**, the IP address for the computer with the user interface could be e.g. **172.16.1.200**. It is important that the subnet sections of both IP addresses **172.16** tally.

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Incorrect parameters may damage devices and result in system malfunctions in the PV diesel hybrid system. All adjustable parameters are protected by the password of the user group **Installer**.

- Only a qualified person is permitted to set and adjust parameters.
- Only give the password for the user group **Installer** to qualified persons.
- Change the default passwords as soon as possible.

Procedure:

1. Enter the IP address of the Fuel Save Controller marked with the extension **:8080** (e.g., **172.16.1.21:8080**) in the address bar of the web browser and press Enter.
   ☑ The home page of the user interface appears (see Section 4.6, page 16).
2. Log into user group **User** or **Installer** with the appropriate password for the user group:
   - When logging in for the first time, enter the default password of your user group.
   - If you have already changed the default password of your user group, enter the changed password.
   - Press the enter key.
   - Select the button [**Login**].

Log out

A maximum of 5 **Users**and 1 **Installer** can be logged into the user interface of the Fuel Save Controller simultaneously. Users are not automatically logged out by closing the web browser. Therefore we recommend always logging out of the user interface prior to closing the web browser.

If a user has not shown any activity on the user interface for more than 30 minutes, this user will be warned that he is about to be logged out automatically. If this warning is not acknowledged within 10 seconds, the user is automatically logged out.

Procedure:

- Click the logout link in the header.

5.2 Changing Passwords

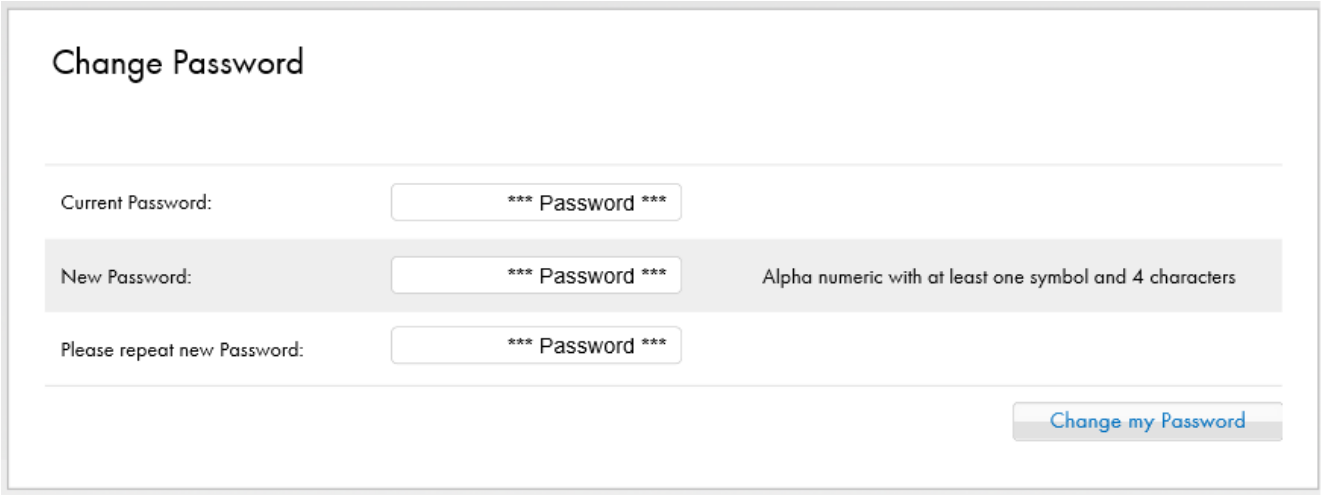


Figure 7: Dialog box **Change Password**

Requirements:

☐ To change the password for the user group **User**, you must be logged in as **User**.

☐ To change the password for the user group **Installer**, you must be logged in as **Installer**.

Procedure:

1. Open the dialog box **Change Password** via the following path **Settings > Change Password**.
2. Enter the current password in the entry field **Current Password:** and press the enter key.
3. Enter the new password in the entry field **New Password:** and press the enter key.
4. Enter the current password in the entry field **Please repeat new Password:** and press the enter key.
5. Press [**Apply**].

5.3 Setting the Time Zone

1. Open the **General Settings** menu by choosing **Settings > General**.
2. In the **Set time zone** drop-down list, select the desired time zone.
3. Press [**Apply**].

5.4 Setting the User Interface Language

1. If you are logged in as **User**, proceed as follows:
   - Go to **Settings > General** to open the **General Settings** menu.
   - In the **Select language** drop-down list, select the desired language.
   - Press [**Apply**].
2. If you are logged in as **Installer**, proceed as follows:
   - Press the Home symbol in the header.
   - Activate the menu **Plant Overview**.
   - Go to **Settings > General** to open the **General Settings** menu.
   - In the **Select language** drop-down list, select the desired language.

- Press [**Apply**].

6 System Monitoring

6.1 Retrieving Display Values of the Entire PV Diesel Hybrid System

Overview of the display values

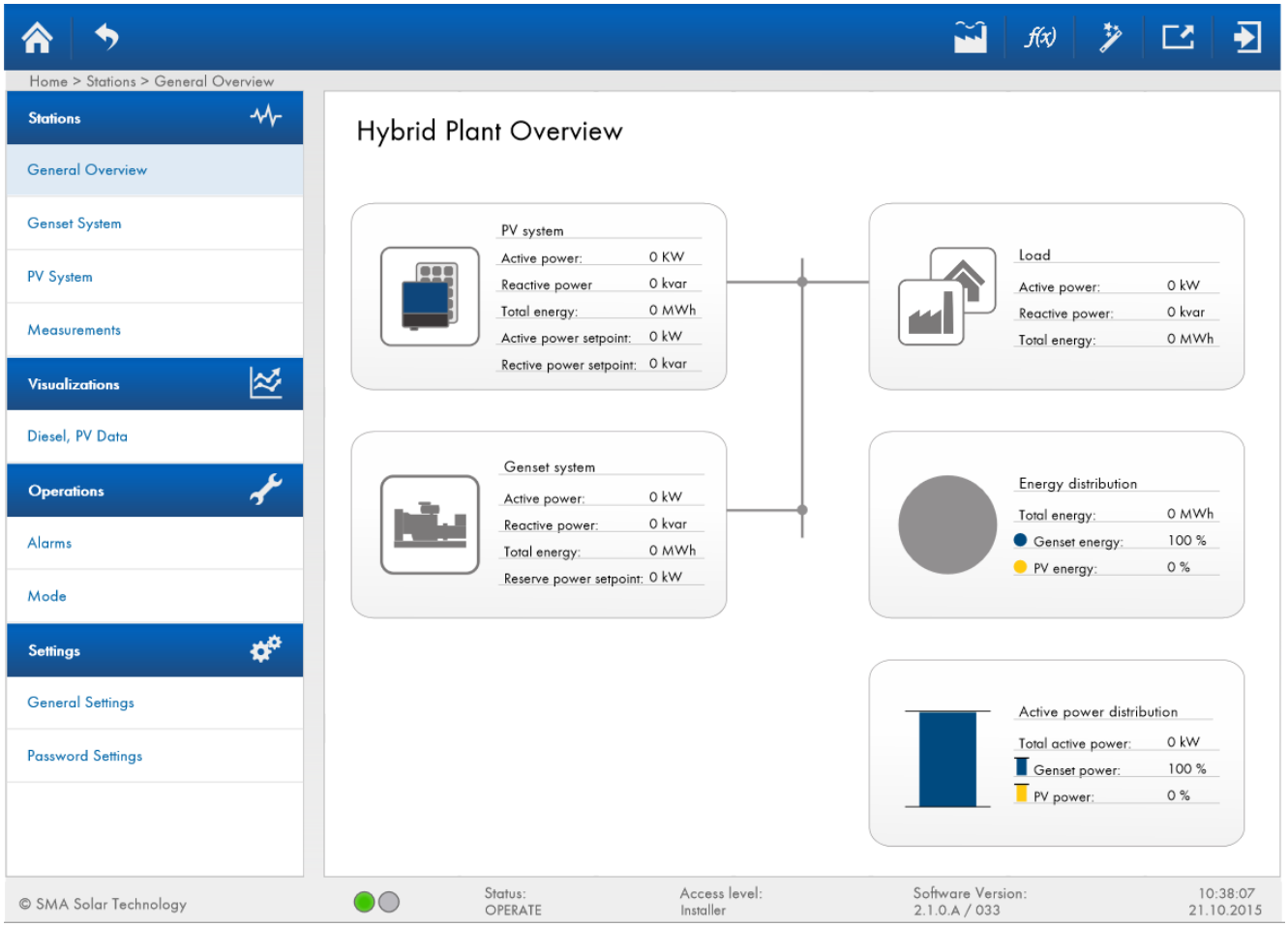


Figure 8: **Hybrid Plant Overview**: Overview of the display values for the PV diesel hybrid system (example)

Display group	Display value	Description
PV system	Active power	Current active power of the PV power plant in kW
	Reactive power	Current reactive power of the PV power plant in kvar
	Total energy	PV power plant energy fed into the hybrid grid in MWh
	Active power setpoint	Setpoint for the active power of the PV power plant
	Reactive power set-point	Setpoint for the reactive power of the PV power plant
Load	Active power	Current active power of the loads in kW
	Reactive power	Current reactive power of the loads in kvar
	Total energy	Energy consumed by the loads in MWh

Display group	Display value	Description
Genset system	Active power	Current active power of the gensets in kW
	Reactive power	Current reactive power of the gensets in kvar
	Total energy	Genset energy fed into the hybrid grid in MWh
	Reserve power set-point	Setpoint for the reserve power of the gensets
Energy distribution	Total energy	Energy consumed by the loads in MWh
	Genset energy	Share of genset energy consumed by the loads in %
	PV energy	Share of the load energy consumption supplied by the PV power plant, in %
Active power distribution	Total active power	Active power currently consumed by the loads in kW
	Genset power	Share of genset active power currently consumed by the loads in %
	PV power	Share of PV power plant active power currently consumed by the loads in %

Procedure:

1. To do this you must be logged in as **Installer**: Go to the menu **Plant Overview** via the page and menu selection.
2. Choose **Stations > General Overview** via the page and menu selection.

6.2 Retrieving Genset Display Values

The **Generator system overview** page contains the display values for all of the gensets in the PV diesel hybrid system. The genset names are assigned during commissioning.

Overview of the display values

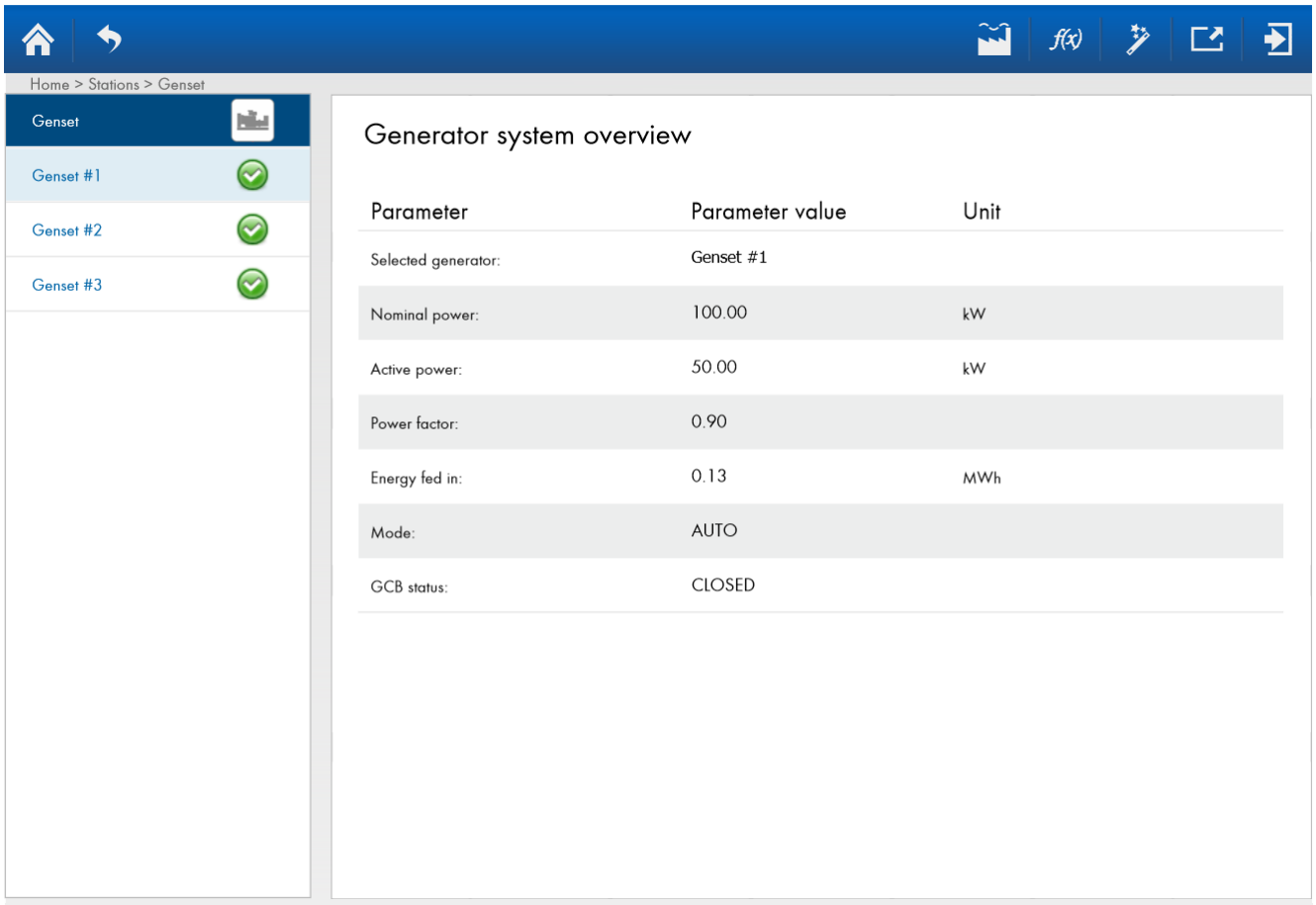


Figure 9: **Generator system overview**: Display values of the gensets (example)

Display value	Description	Value	Explanation
Selected generator	Currently displayed genset	–	–
Nominal power	Nominal power of the selected genset in kW	–	–
Active Power	Current active power of the selected genset in kW	–	–
Power factor	Power factor: specifies the ratio of active power to apparent power.	–	–
Energy fed in	Grid feed-in: Energy fed into the hybrid grid in MWh	–	–

Display value	Description	Value	Explanation
Mode	Operating mode of the selected genset	STOP	Genset is out of service (e.g., for maintenance work)
		MANUAL	Genset is in manual mode.
		AUTO	Genset is in automatic mode and can be activated by means of the autostart signal.
		LDSS	The genset is activated and deactivated via the genset system's power management function.
GCB status	Current status of the circuit breakers that connect the genset to the hybrid grid	CLOSED	The genset is connected to the hybrid grid.
		OPEN	The genset is not connected to the hybrid grid.

Procedure:

1. To do this you must be logged in as **Installer**: Go to the menu **Plant Overview** via the page and menu selection.
2. Choose **Stations > Genset System** via the page and menu selection.
   ☑ The designations of all the gensets are displayed in the page and menu selection.
3. Select the desired genset via the page and menu selection.

6.3 Retrieving PV Power Plant Display Values

Overview of the display values

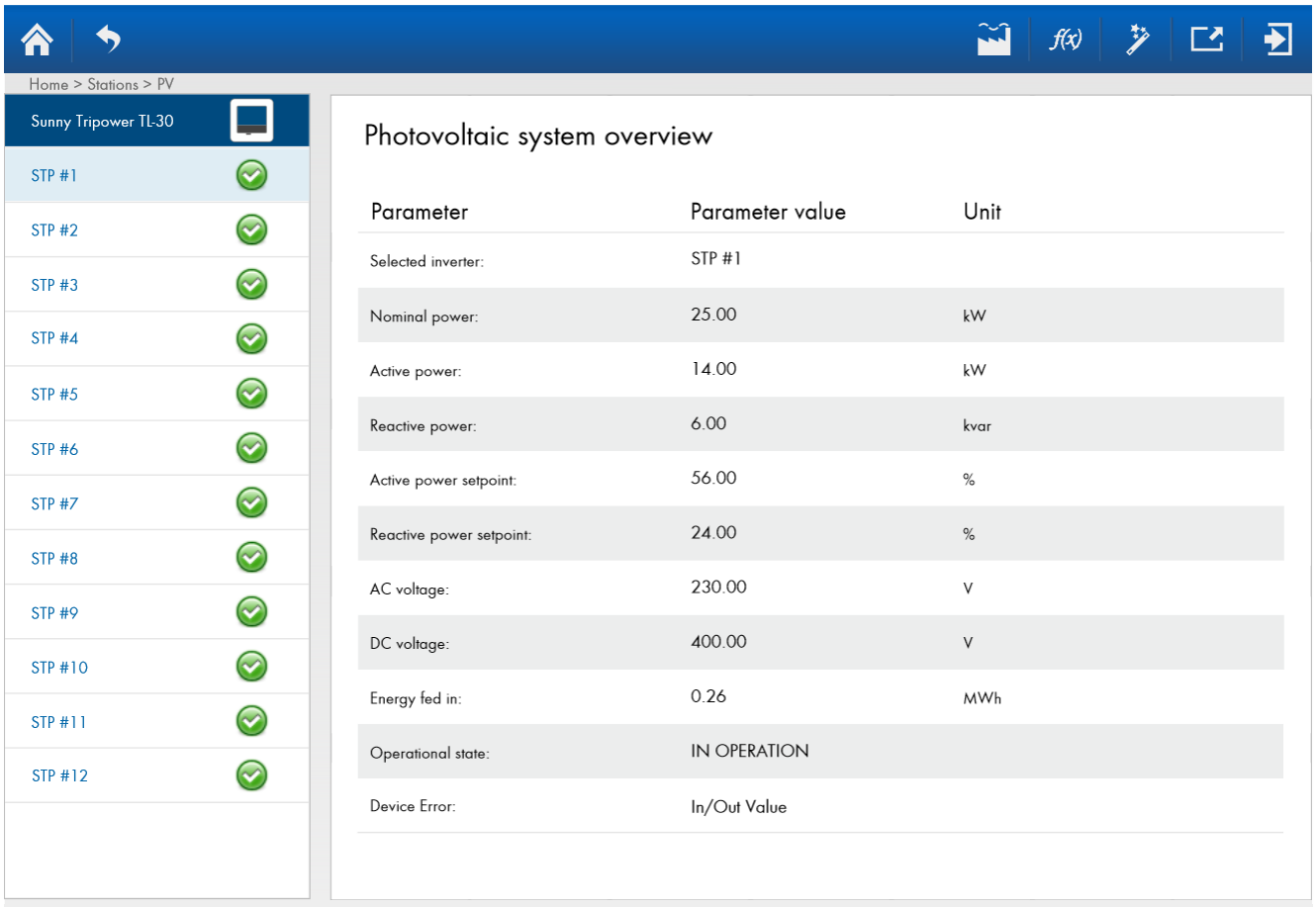


Figure 10: **Photovoltaic system overview**: PV power plant display value (example)

Display value	Description	Value	Explanation
Selected inverter	Currently displayed inverter	–	–
Nominal power	Nominal power of the inverter in- kW	–	–
Active power	Current active power of the inverter in kW	–	–
AC voltage	AC output voltage of the inverter in V	–	–
DC voltage	DC input voltage of the inverter in V	–	–
Reactive power	Current reactive power of the inverter in kVar	–	–
Active power setpoint	Setpoint for the current active power as a ratio of nominal power, in %	–	–

Display value	Description	Value	Explanation
Reactive power set-point	Setpoint for the current reactive power as a ratio of nominal power, in %	–	–
Energy fed in	Grid feed-in: Energy fed into the hybrid grid in MWh	–	–
Operational state	Current operating mode of the inverter	STOP	The inverter is switched off.
		WAIT FOR DC	The inverter is waiting for DC input voltage.
		WAIT FOR AC	The inverter is waiting for an available local grid at the AC output.
		COM ERROR	Communication between inverter and Fuel Save Controller has failed.
		WAIT FOR SETPOINT	The inverter is waiting for a setpoint from the Fuel Save Controller.
		IN OPERATION	The inverter is feeding in.
		WARNING	A warning has occurred in the inverter.
		ERROR	An error has occurred in the inverter.
Device Error	Error in the inverter	–	See inverter documentation

Procedure:

1. To do this you must be logged in as **Installer**: Go to the menu **Plant Overview** via the page and menu selection.
2. Choose **Stations > PV System** via the page and menu selection.
   ☑ The designations of all the inverters are displayed in the page and menu selection.
3. Select the desired inverter via the page and menu selection.

6.4 Retrieving Display Values from Measurement Devices

The values obtained from the measurement modules of the Fuel Save Controller are displayed on the **Measurement system overview** page.

Overview of the display values

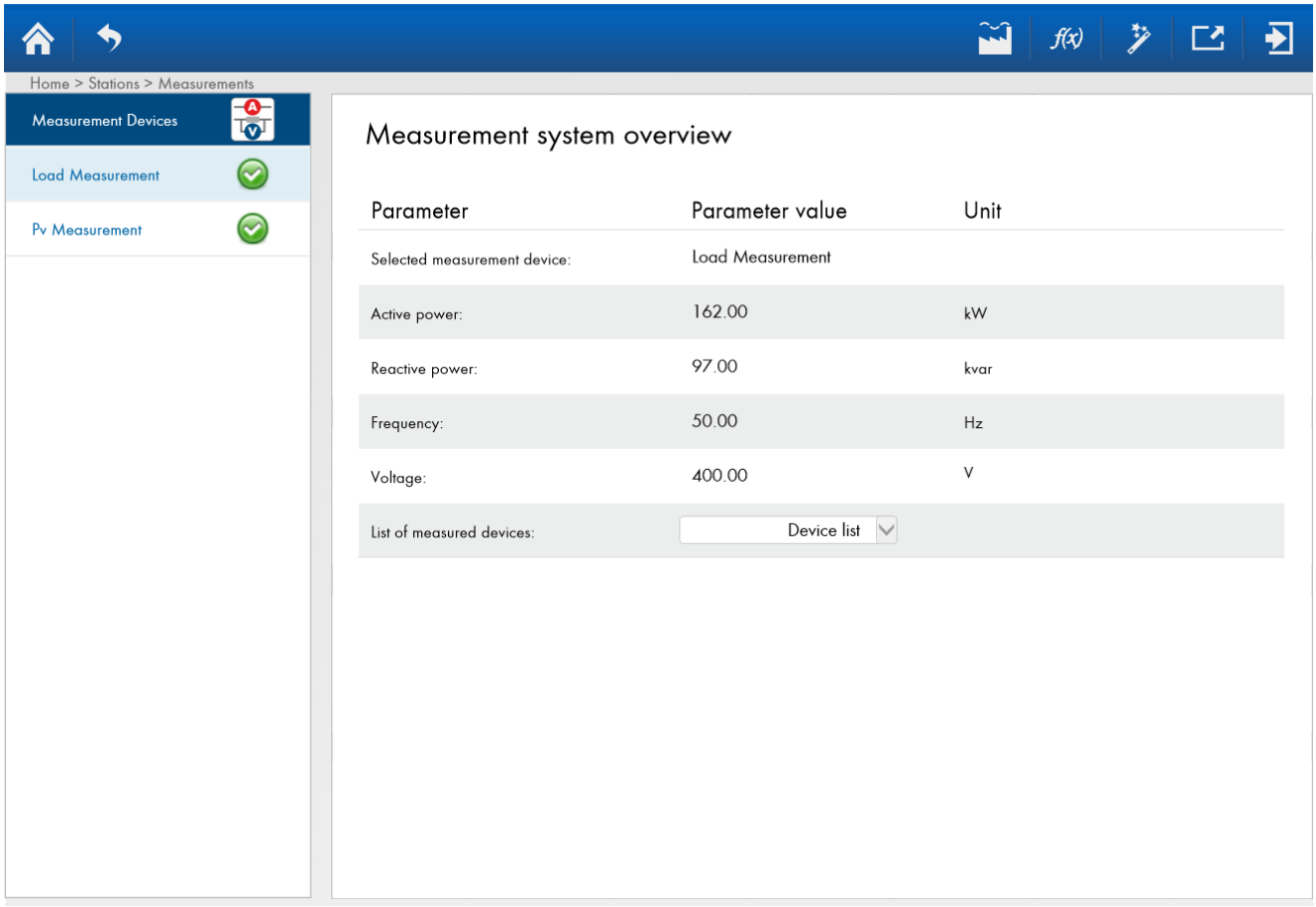


Figure 11: **Measurement system overview**: Display values of the measurement module (example)

Display value	Description
Selected measurement device	Currently displayed measurement system
Active power	Calculated active power in kW
Reactive power	Calculated reactive power in kvar
Frequency	Measured frequency in Hz
Voltage	Measured voltage in V
List of measured devices	List containing all the devices in the PV diesel hybrid system to which the currently displayed measurement device is assigned.

Procedure:

1. To do this you must be logged in as **Installer**: Go to the menu **Plant Overview** via the page and menu selection.
2. Choose **Stations > Measurements** via the page and menu selection.
   ☑ The designations of all the measurement systems are displayed in the page and menu selection.
3. Select the desired measurement device via the page and menu selection.

6.5 Viewing Data Records for the PV Power Plant and Gensets

On the **Historical Data** page, the SMA Fuel Save Controller depicts a selection of power values over time. Different analysis periods can be selected here:

- the last minute
- the last 5 minutes
- the last hour
- the last 24 hours

Overview of data records:

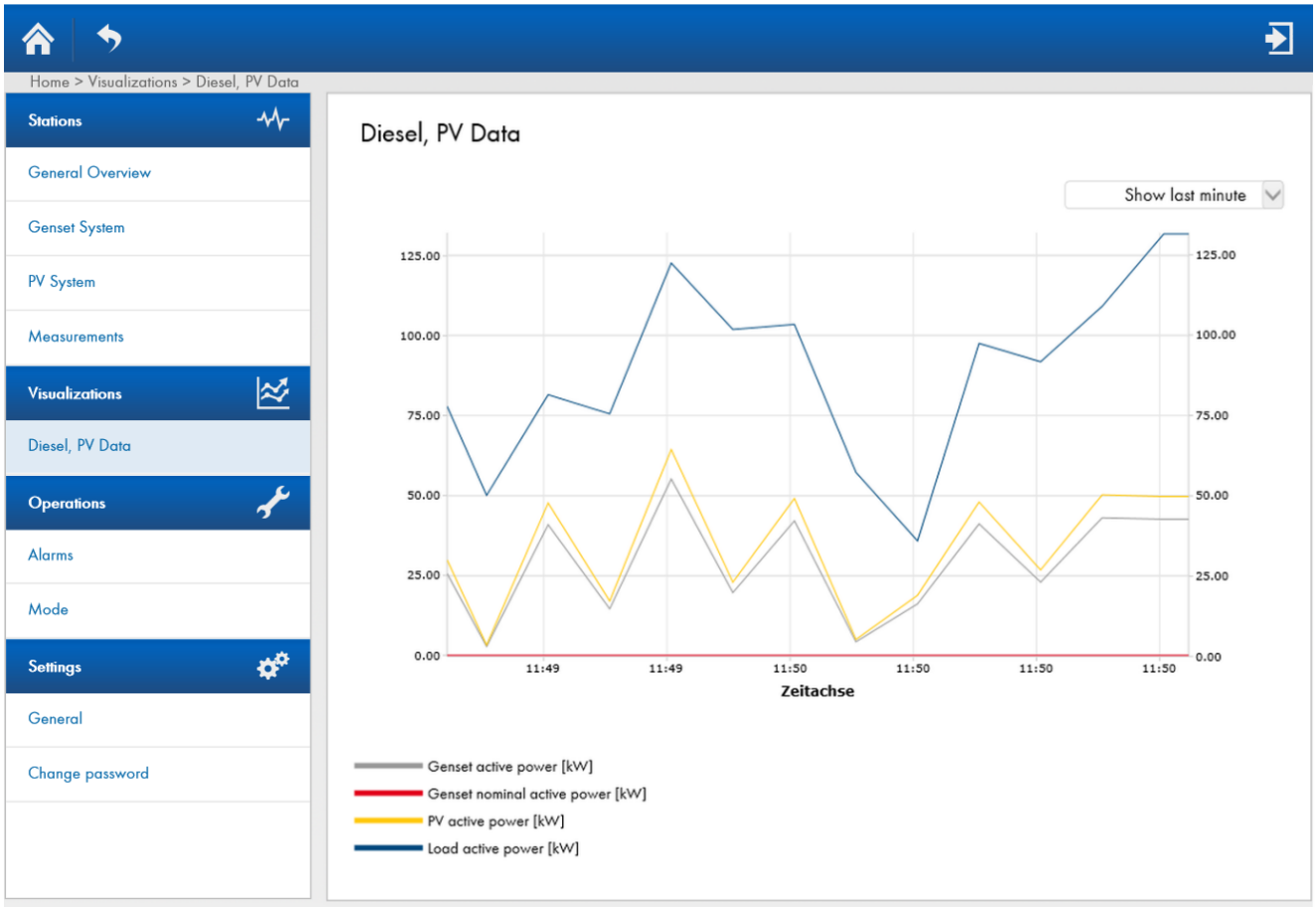


Figure 12: **Diesel, PV Data**: Overview of data records of the PV power plant and gensets (example)

Display value	Description
Genset active power	Active power supplied by the gensets in kW
Genset nominal active power	Sum of nominal power of all active gensets in kW
PV active power	Active power of the PV power plant in kW
Load active power	Active power consumed by the loads in kW

Procedure:

1. To do this you must be logged in as **Installer**: Go to the menu **Plant Overview** via the page and menu selection.
2. Choose **Visualizations > Diesel, PV Data** via the page and menu selection.
3. Select the desired period (e.g., **Show last hour**) via the drop-down list.

6.6 Processing Status Messages

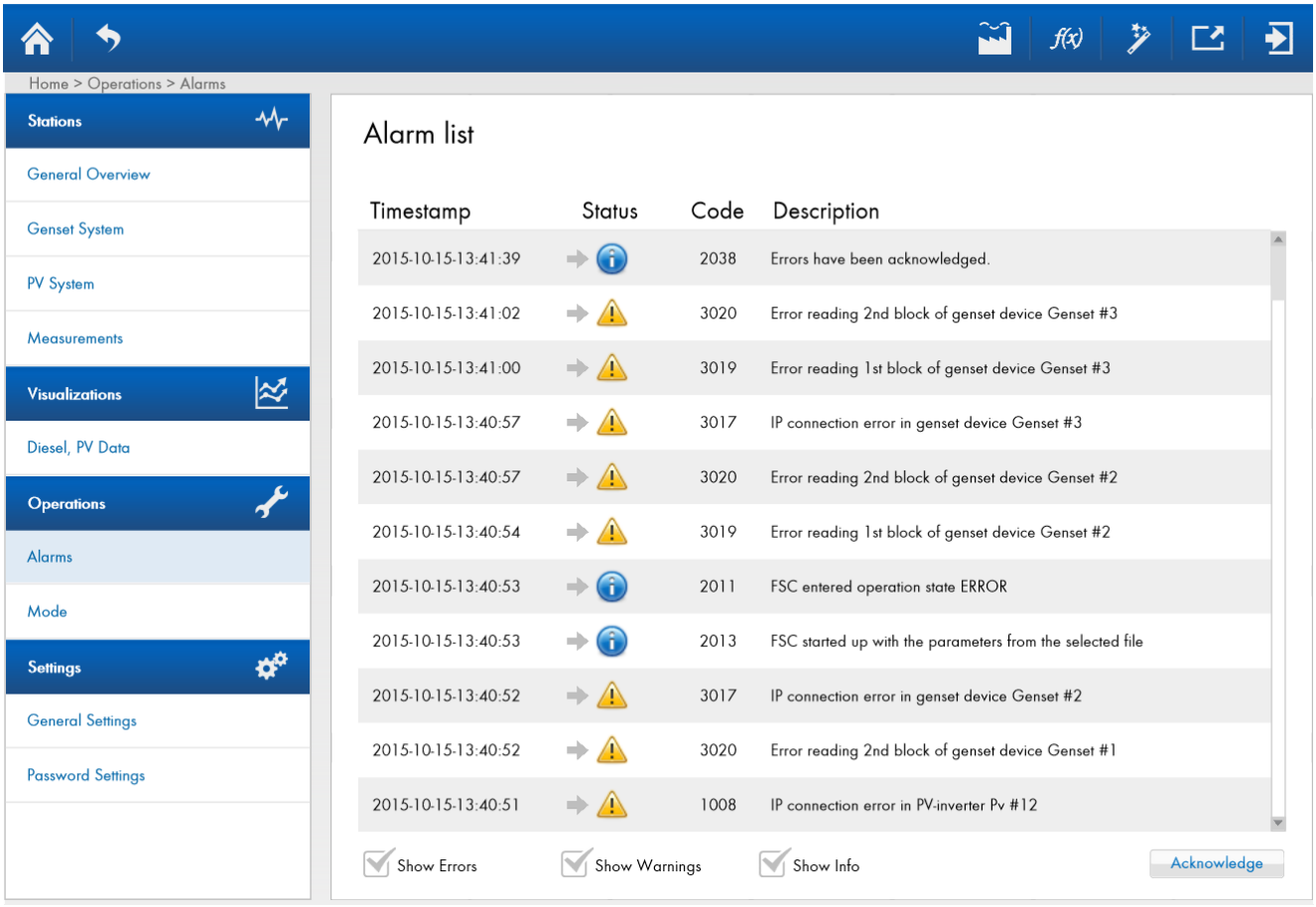

Home > Operations > Alarms
Stations
General Overview
Genset System
PV System
Measurements
Visualizations
Diesel, PV Data
Operations
Alarms
Mode
Settings
General Settings
Password Settings
Alarm list
Timestamp Status Code Description
2015-10-15-13:41:39 2038 Errors have been acknowledged.
2015-10-15-13:41:02 3020 Error reading 2nd block of genset device Genset #3
2015-10-15-13:41:00 3019 Error reading 1st block of genset device Genset #3
2015-10-15-13:40:57 3017 IP connection error in genset device Genset #3
2015-10-15-13:40:57 3020 Error reading 2nd block of genset device Genset #2
2015-10-15-13:40:54 3019 Error reading 1st block of genset device Genset #2
2015-10-15-13:40:53 2011 FSC entered operation state ERROR
2015-10-15-13:40:53 2013 FSC started up with the parameters from the selected file
2015-10-15-13:40:52 3017 IP connection error in genset device Genset #2
2015-10-15-13:40:52 3020 Error reading 2nd block of genset device Genset #1
2015-10-15-13:40:51 1008 IP connection error in PV-inverter Pv #12
Show Errors
Show Warnings
Show Info
Acknowledge

Figure 13: Alarm list in the SMA Fuel Save Controller (example)

Name of the column	Description	
Timestamp	Time at which the message was recorded:	
Status		Event
		Warning If an error occurs, automatic operation of the PV diesel hybrid system is continued.
		Error If an error occurs, automatic operation of the PV diesel hybrid system is discontinued.
		Warning or error no longer exists.
		Event, warning or error has occurred.
Code	Four-digit number of the reported event, warning or error	
Description	Description of the reported event, warning or error	

Using the scrollbar

If not all messages can be displayed on the user interface, a scrollbar appears on the "Alarm list" page. You can only use this scrollbar by means of the arrow keys.

- To call up messages recorded at an earlier time, press the arrow key up.
- To call up messages recorded at a later time, press the arrow key down.

Procedure:

1. To do this you must be logged in as **Installer**: Go to the menu **Plant Overview** via the page and menu selection.
2. Choose **Operations > Alarms** via the page and menu selection.
3. Make sure that the filter for desired messages is set correctly:
   - E.g., to view errors only, activate the **Show Errors** filter and deactivate the **Show Warnings** and **Show Info** filters.
   - E.g., to view warnings only, activate the **Show Warnings** filter and deactivate the **Show Errors** and **Show Info** filters.
   - E.g., to view events only, activate the **Show Info** filter and deactivate the **Show Errors** and **Show Warnings** filters.
4. Processing reported warnings:
   - Ascertain and remove the cause of the warning.
5. Processing reported errors:
   - Ascertain and remove the cause of the error. To do so, contact the SMA Service Line (see Section 12, page 68).
   - Once the cause of the error has been eliminated, acknowledge the error message. To do so, press [**Acknowledge**].
6. To acknowledge reported warnings or events, press [**Acknowledge**].

6.7 Operating Mode and Setpoints

6.7.1 Overview of Operating Modes and Setpoints

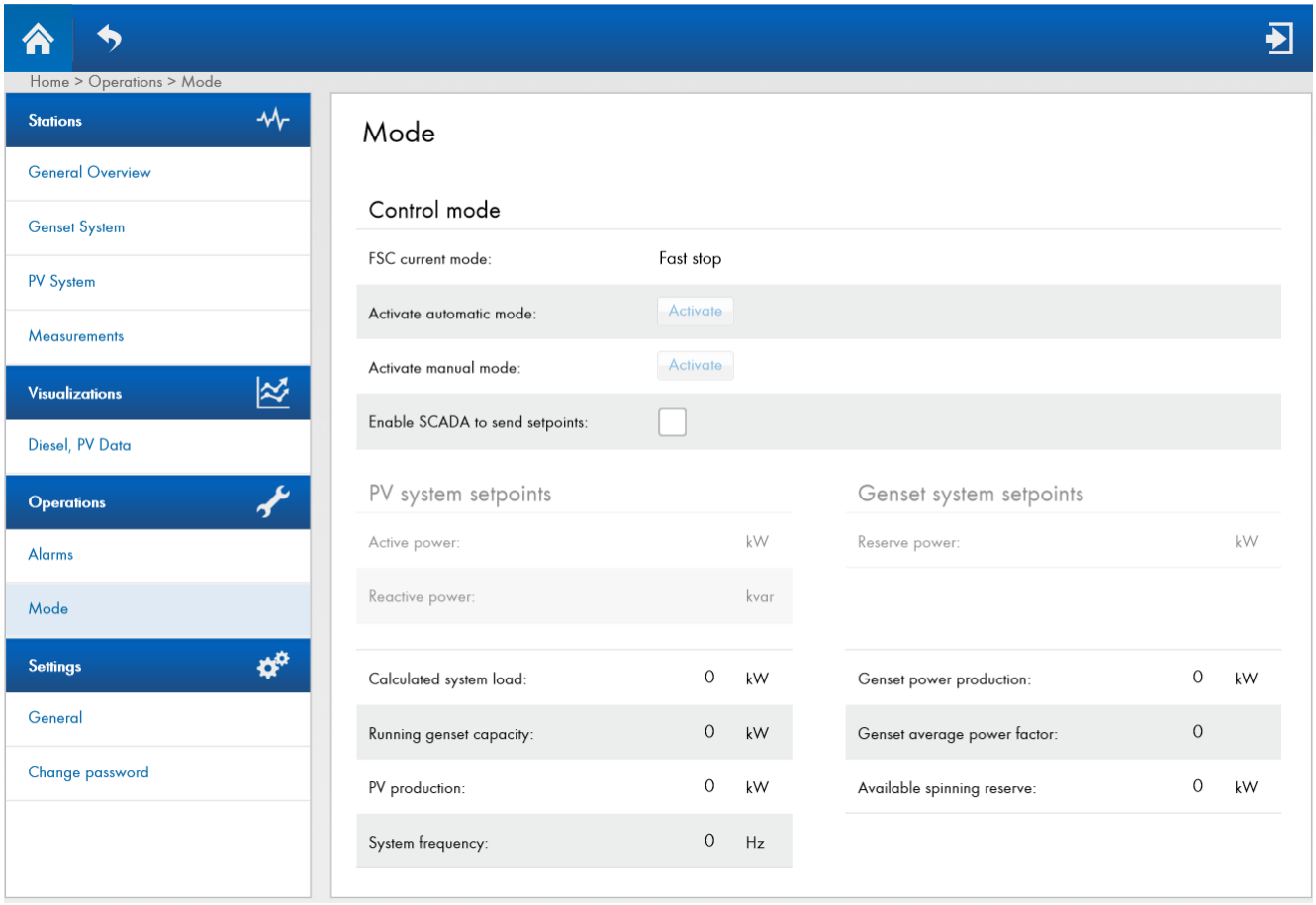


Figure 14: **Mode** page with overview of current operating state of the Fuel Save Controller (example)

Display group	Parameters / Functions	Description
Control Mode	FSC current mode	Shows the current operating mode of the SMA Fuel Save Controller: • **Automatic** mode The SMA Fuel Save Controller calculates the setpoints for the PV power plant and the reserve power to be retained by the gensets. The SMA Fuel Save Controller normally operates in **Automatic** mode. In **Automatic** mode it is possible to have the setpoints for the PV power plant specified by a SCADA system. • **Manual** mode The reserve power to be kept by the gensets is specified via the user interface. **Manual** mode is normally used only when the SMA Fuel Save Controller is being commissioned.
	Activate automatic mode	To activate the **Automatic** mode (see Section 6.7.3, page 36)
	Activate manual mode	To activate the **Manual** mode (see Section 6.7.3, page 36)
	Enable SCADA to send setpoints	To activate setpoint specification by a SCADA system (see Section 6.7.4, page 36)
PV system setpoints	Active power	Current setpoint for the active power of the PV power plant in kW
	Reactive power	Current setpoint for the reactive power of the PV power plant in kvar
	Calculated system load	Calculated active power requirement of the loads in kW
	Running genset capacity	Sum of nominal power of all active gensets in kW
	PV production	Active power of all inverters in kW
	System frequency	Frequency of the system in Hz
Genset system setpoints	Reserve power	Setpoint specified by the SMA Fuel Save Controller for the reserve power of the gensets
	Genset power production	Total active power of all gensets in kW
	Genset average power factor	Average power factor of the gensets
	Available spinning reserve	Reserve power in kW currently provided by the gensets

6.7.2 Displaying Setpoints

1. To do this you must be logged in as **Installer**: Go to the menu **Plant Overview** via the page and menu selection.
2. Choose **Operations > Mode** via the page and menu selection (see Section 6.7.1 "Overview of Operating Modes and Setpoints", page 34).

6.7.3 Configuring the Operating Mode

1. To do this you must be logged in as **Installer**: Go to the menu **Plant Overview** via the page and menu selection.
2. Choose **Operations > Mode** via the page and menu selection (see Section 6.7.1 "Overview of Operating Modes and Setpoints", page 34).
3. To activate **Automatic** mode, press [**Activate**] in the **Activate automatic mode** bar.
4. To activate **Manual** mode, press [**Activate**] in the **Activate manual mode** bar.

6.7.4 Specification of Setpoints for PV Power Plant by SCADA System

When this function is active, a SCADA (Supervisory Control and Data Acquisition) system specifies the setpoints for the PV power plant and the reserve power to be retained by the gensets in the Fuel Save Controller. The Fuel Save Controller checks these setpoints. Should the setpoints issued by the SCADA system jeopardize the stability of the PV diesel hybrid system, they will be corrected by the Fuel Save Controller. Finally the setpoints are forwarded to the PV power plant by the Fuel Save Controller.

Procedure:

1. To do this you must be logged in as **Installer**: Go to the menu **Plant Overview** via the page and menu selection.
2. Choose **Operations > Mode** via the page and menu selection (see Section 6.7.1 "Overview of Operating Modes and Setpoints", page 34).
3. In the **Control Mode** area activate the **Enable SCADA to send setpoints** checkbox.

7 System Settings

7.1 Configuring the Utility Grid

The system settings of the Fuel Save Controller can only be adjusted when the Fuel Save Controller is in **STANDBY** or **ERROR** mode.

Requirement:

☐ You must be logged in as **Installer**.

Procedure:

1. Choose the menu **Configuration Wizard** via the page and menu selection.
2. In the **Grid** bar press [**Adjust**].
3. To activate the utility grid connection, set the parameter **Enable** to **Yes**.
4. To deactivate the utility grid connection, set the parameter **Enable** to **No**.
5. Press [**Apply**]. This will adopt the setting.

7.2 Configuring Gensets

The system settings of the Fuel Save Controller can only be adjusted when the Fuel Save Controller is in **STANDBY** or **ERROR** mode.

The system settings for the gensets are located in the menus **Genset general configuration** and **Generator configuration Wizard: detailed configuration**. The displayed parameters depend on which gensets are used.

Genset general configuration

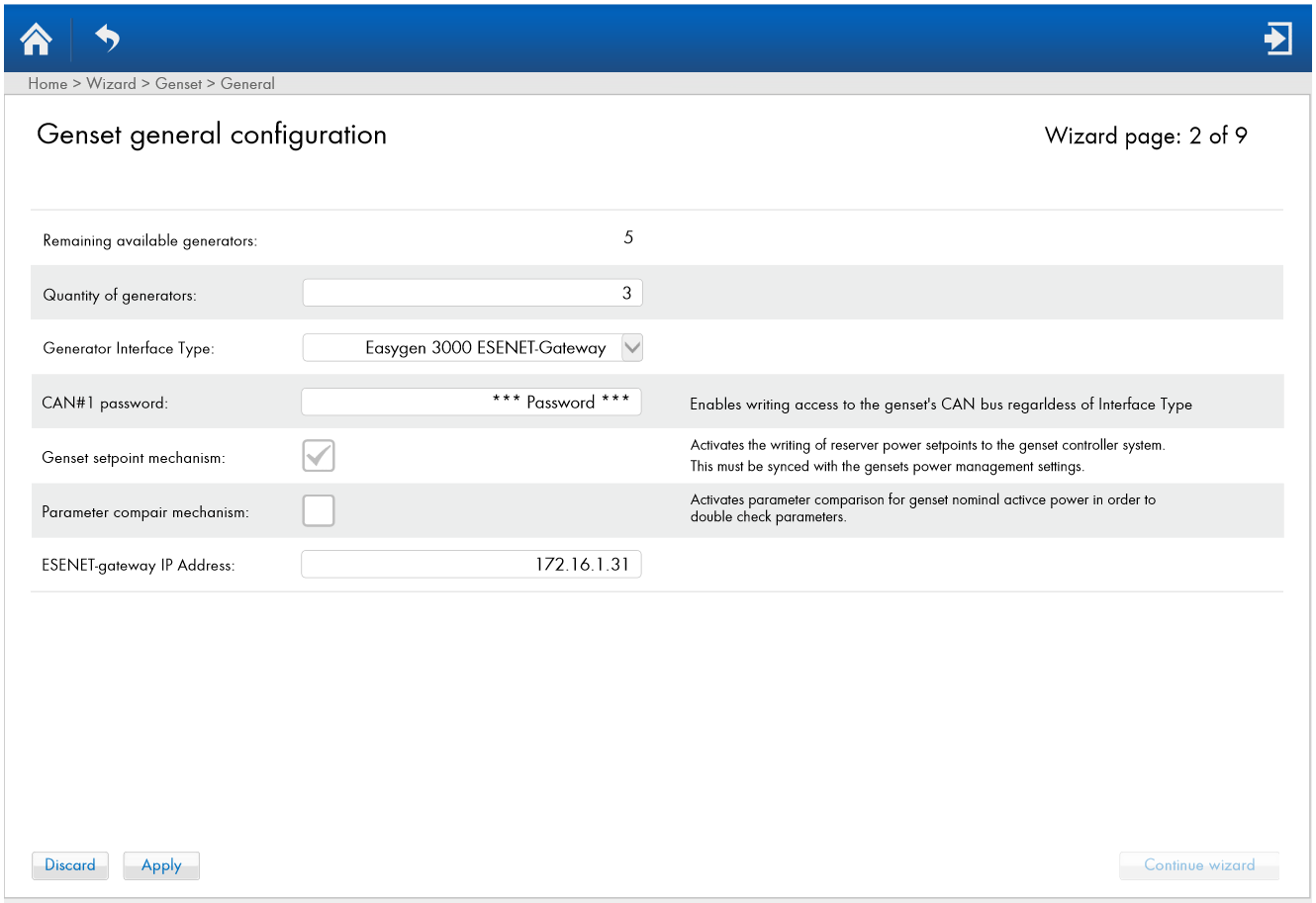

Home > Wizard > Genset > General
Genset general configuration
Wizard page: 2 of 9
Remaining available generators:
5
Quantity of generators:
3
Generator Interface Type:
Easygen 3000 ESENET-Gateway
CAN#1 password:
*** Password ***
Enables writing access to the genset's CAN bus regarldess of Interface Type
Genset setpoint mechanism:
Activates the writing of reserver power setpoints to the genset controller system.
This must be synced with the gensets power management settings.
Parameter compair mechanism:
Activates parameter comparison for genset nominal activce power in order to
double check parameters.
ESENET-gateway IP Address:
172.16.1.31
Discard
Apply
Continue wizard

Figure 15: General system settings of the gensets (example)

Parameter	Description	Value	Explanation	Default value
Remaining available generators	Currently available gensets	0 ... 8	–	0
Quantity of Gensets	Number of installed gensets	0 ... 8	–	0
Genset interface Type	Type of genset interface	Easygen 3000 ESENET-Gateway	Control unit "Woodward Easygen 3000" with Modbus communication	–
		Easygen 3000 CAN	Control unit "Woodward Easygen 3000" with CAN communication	
CAN#1 password	Password for write access to the generator control	0 ... 9999	For setting the password, refer to manufacturer documentation	–

Parameter	Description	Value	Explanation	Default value
Genset setpoint mechanism	Activates the writing of reserve power setpoints to the genset controller system (see Section 8.1, page 52).	Checkbox activated	Writing of reserve power setpoints to the genset controller system is activated	Deactivated
		Checkbox deactivated	Writing of reserve power setpoints to the genset controller system is deactivated	
Parameter compare mechanism	Activates parameter comparison for genset nominal active power in order to /n double check parameters.	Checkbox activated	Comparison of genset nominal power is activated	Deactivated
		Checkbox deactivated	Comparison of genset nominal power is deactivated	
ESENET-Gateway IP address	IP address for ESENET gateway	172.16.1.31 ... 172.16.1.38	Address range defined by the Fuel Save Controller for gensets	–

Generator configuration wizard: detailed configuration

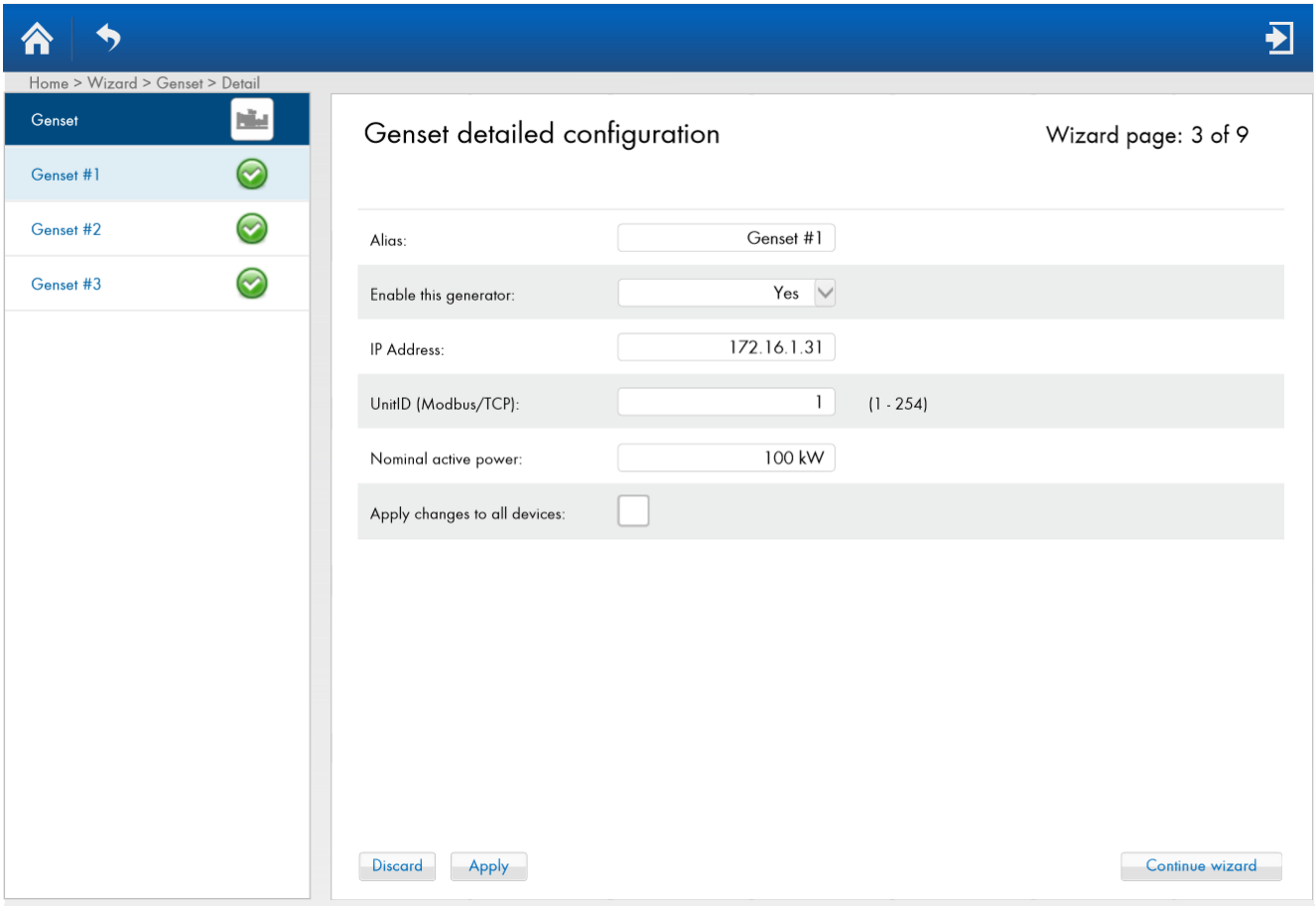


Figure 16: Detailed system settings for the gensets (example)

Parameter	Description	Value	Explanation	Default value
Label	Genset ID	–	–	–

Parameter	Description	Value	Explanation	Default value
	Determines whether the Fuel Save Controller should take the genset into account for control of the PV diesel hybrid system	Yes	The Fuel Save Controller takes the genset into account.	No
		No	The Fuel Save Controller does not take the genset into account.	
IP Address	ID address of the genset (not applicable with a higher-level control system)	172.16.1.31 ... 172.16.1.38	Address range defined by the Fuel Save Controller for gensets Enable this generator	–
Unit ID (Modbus/TCP)	Identification of the genset	1 ... 254	–	–
Nominal active power	Nominal power of the genset	–	–	–

Requirement:

☐ You must be logged in as **Installer**.

NOTICE

Destruction of gensets due to insufficient reserve power

Once the SMA Fuel Save Controller and PV power plant have stopped, the PV power plant is no longer available as energy supplier. Now only the gensets supply the loads. If the current reserve power of the gensets is insufficient for supplying the power required by the loads, the gensets become overloaded Sustained overload of the gensets can result in failure of the power supply and destruction of the gensets.

- Prior to stopping the Fuel Save Controller, always check whether the current reserve power of the gensets is sufficient to cover the requirement of the loads.
  - If the current reserve power of the gensets is insufficient, switch off the loads or connect additional gensets. This increases the reserve power of the gensets.
- If the power management and the communication interface of the genset is not compatible with the Fuel Save Controller, power management must be deactivated on the Fuel Save Controller. In this case, the gensets must be monitored to ensure that sufficient reserve power is retained.
- Make sure that the setpoints for power management on the Fuel Save Controller and the gensets are set to the same value.

Procedure:

1. Choose the menu **Configuration Wizard** via the page and menu selection.
2. In the **Genset System** bar, press [**Adjust**].
3. Set the parameters in the menu **Genset general configuration** (see Section 4.8.3, page 19).
4. Press [**Continue wizard**].
5. Set the parameters in the menu **Generator configuration Wizard: detailed configuration** (see Section 4.8.3, page 19).
6. To change a particular parameter for all gensets, activate the **Apply changes to all devices** checkbox.

7. To change a particular parameter for individual gensets, deactivate the **Apply changes to all devices** checkbox.
8. To continue with system settings, press [**Continue wizard**].
9. To end system settings, press [**Done**].

7.3 Configuring the PV Power Plant

The system settings of the Fuel Save Controller can only be adjusted when the Fuel Save Controller is in **STANDBY** or **ERROR** mode.

The system settings for the inverters are located in the menus **PV general configuration** and **PV system configuration wizard**.

PV general configuration

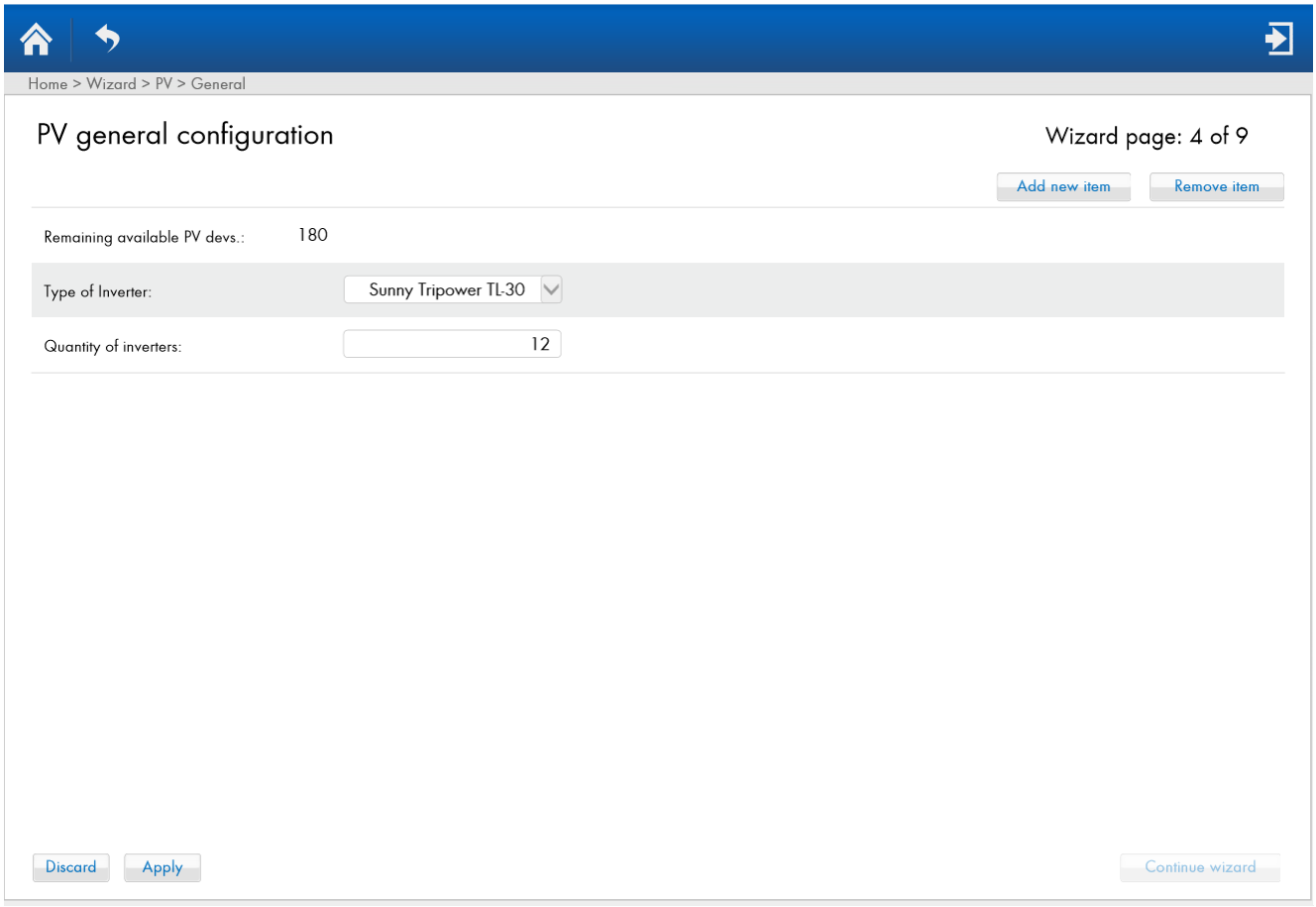


Figure 17: General system settings of the PV power plant (example)

Parameter	Description	Value
Remaining available PV devices	Currently available PV inverters	0 ... 64
Type of inverter	Inverter device type	–
Quantity of inverter	Number of inverters of the same device type	0 ... 64

PV detailed configuration

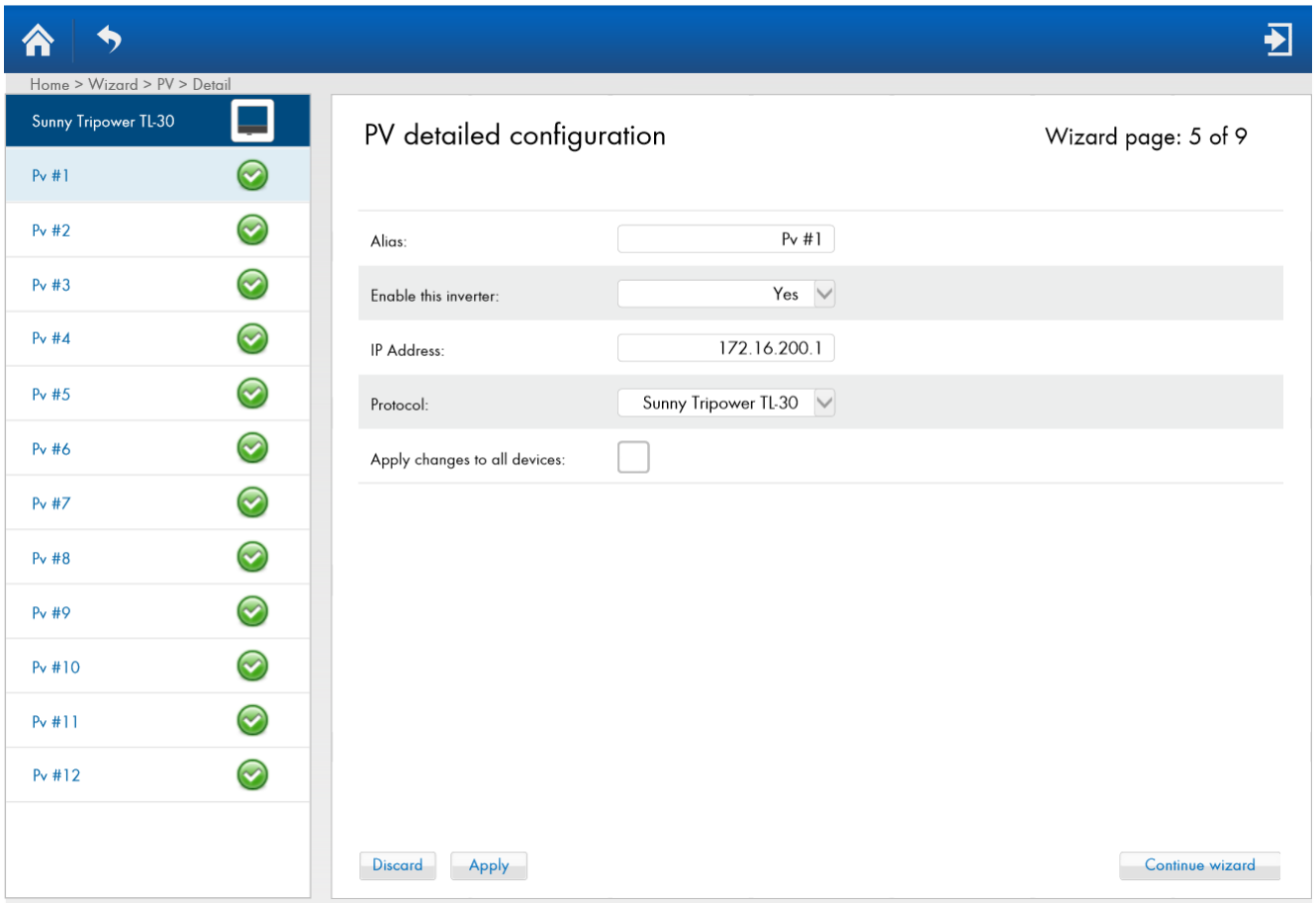


Figure 18: Detailed system settings of the PV power plant (example)

Parameter	Description	Value	Explanation	Default value
Label	Type label for identifying the inverter	–	–	–
Enable this inverter	Determines whether the Fuel Save Controller should take the inverter into account in the control of the PV diesel hybrid system.	Yes	The Fuel Save Controller takes the inverter into account.	No
		No	The Fuel Save Controller does not take the inverter into account.	
IP Address	IP address of the inverter	172.16.200.1 ... 172.16.200.64	Address range defined by the Fuel Save Controller for inverters	–
Protocol	Communication protocol used by the inverter	Defined by **Type of inverter**	See inverter documentation	Defined by **Type of inverter**
		Different communication protocol		

Requirement:

☐ You must be logged in as **Installer**.

Procedure:

1. Choose the menu **Configuration Wizard** via the page and menu selection.
2. In the **PV System** bar, press [**Adjust**].
3. Set the parameters in the menu **PV general configuration** (see Section 4.8.3, page 19).
4. Press [**Continue wizard**].
5. Set the parameters in the menu **PV general configuration** (see Section 4.8.3, page 19).
6. To change a particular parameter for all inverters, activate the **Apply changes to all devices** checkbox.
7. To change a particular parameter for individual inverters, deactivate the **Apply changes to all devices** checkbox.
8. To continue with system settings, press [**Continue wizard**].
9. To end system settings, press [**Done**].

7.4 Configuring Measurement Devices

The system settings of the Fuel Save Controller can only be adjusted when the Fuel Save Controller is in **STANDBY** or **ERROR** mode.

The system settings for the measurement devices are located in the menus **Measurement devices general configuration** and **Measurement Device configuration Wizard**.

Measurement devices general configuration

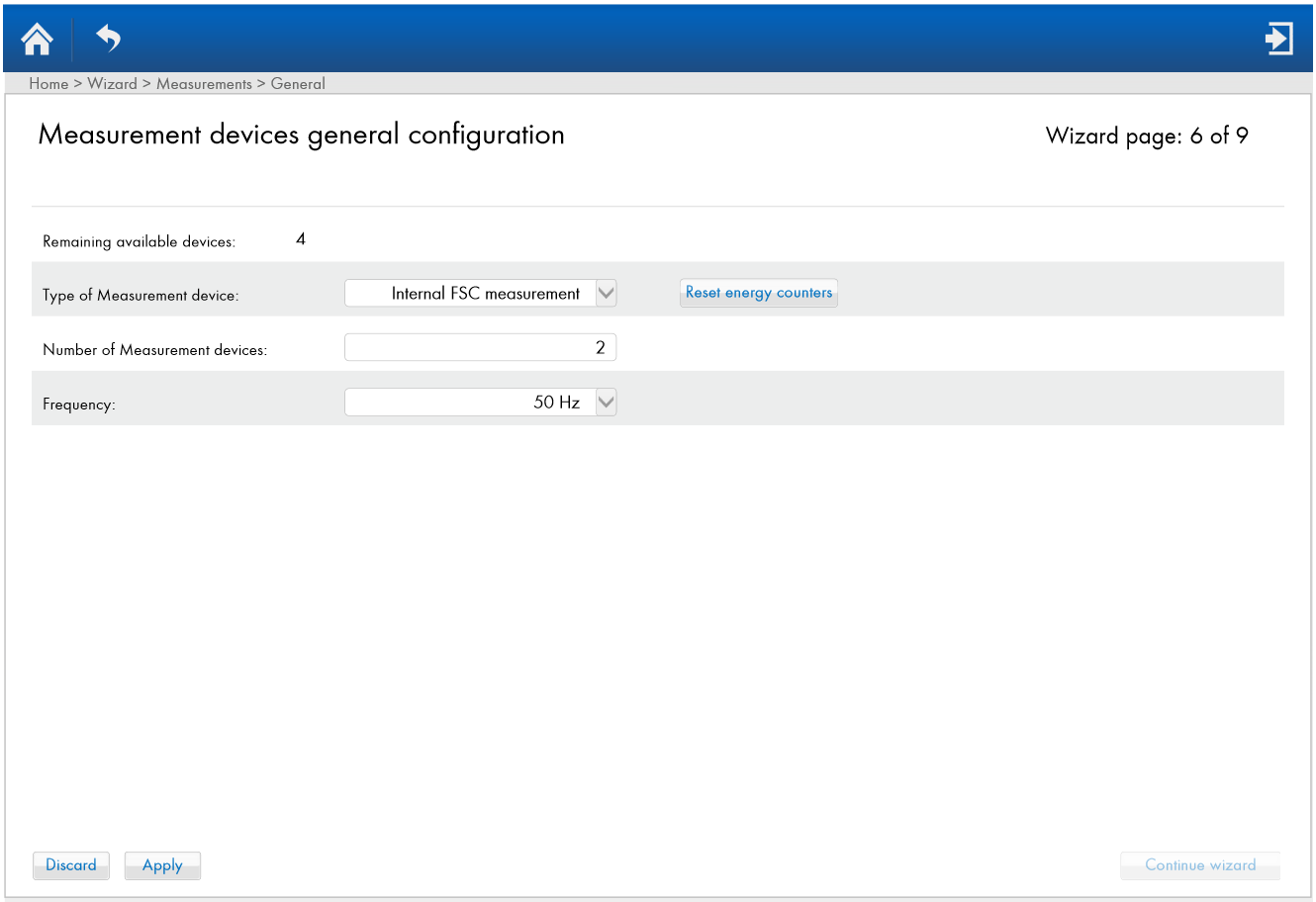


Figure 19: General system settings for the measurement devices (example)

Parameter	Description	Value	Explanation	Default value
Remaining available devices	Currently available measurement devices	0 ... 6	–	–
Type of Measurement device	Measurement device type	Internal FSC measurement	Internal measurement modules in the Fuel Save Controller	Internal FSC measurement
Number of Measurement devices	Number of measurement devices	0 ... 6	–	0
Frequency	Nominal frequency	50 Hz	–	50 Hz
		60 Hz	–	

Measurement Device configuration Wizard

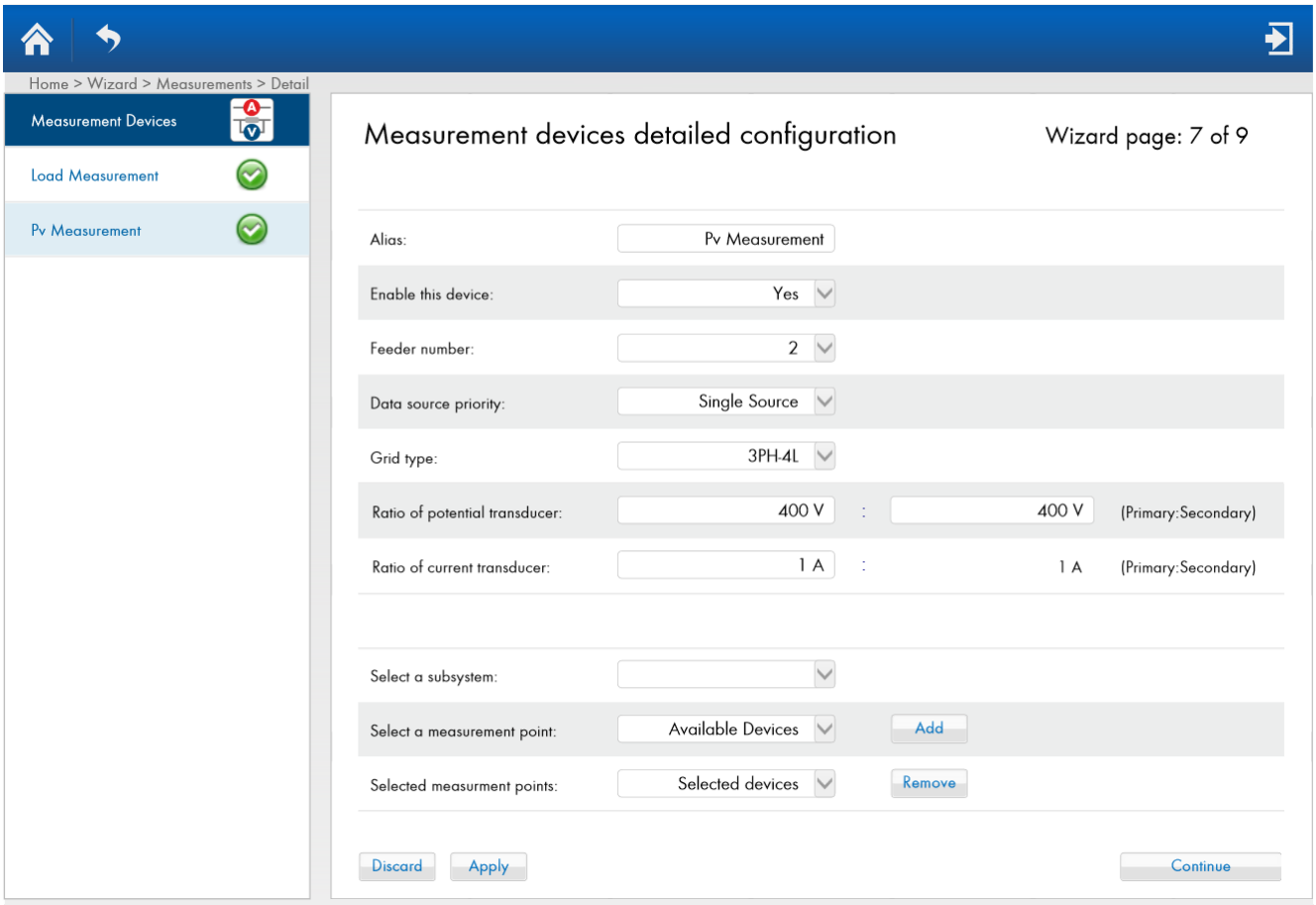


Figure 20: Detailed system settings for the measurement devices (example)

Parameter	Description	Value	Explanation	Default value
Alias	Name for identification of measurement devices	–	–	–
Enable this device	Determines whether the Fuel Save Controller should take the measurement device into account in the control of the PV diesel hybrid system	Yes	The Fuel Save Controller takes the measurement device into account.	No
		No	The Fuel Save Controller does not take the measurement device into account.	
Feeder number	Current measurement number (see installation manual of the Fuel Save Controller)	1 ... 6	–	–

Parameter	Description	Value	Explanation	Default value
Data source priority	If communication fails, the measured values from the Fuel Save Controller are used.	Single source	Connection to the device carrying out the measurements is disabled. Only the measured values from the Fuel Save Controller are used.	–
		Second source	Connection to the device carrying out the measurements is enabled. The values communicated by the device have priority. If communication fails, the measured values from the Fuel Save Controller are used.	
		Measurement source	Connection to the device carrying out the measurements is enabled. The values measured by the Fuel Save Controller have priority. In case of measurement failure, the values communicated by the device are used.	
Grid type	Type of grid used for current and voltage measurement	3PH-3L	Three-conductor utility grid with three line conductors	–
		3PH-4L	Four-conductor utility grid with three line conductors and one neutral conductor	
Ratio of potential transducer	Transformation ratio for voltage measurement	The requirements of the measurement inputs must be complied with (see installation manual of the Fuel Save Controller).		
Ratio of current transducer	Transformation ratio for current measurement	The requirements of the measurement inputs must be complied with (see installation manual of the Fuel Save Controller).		
Select a subsystem	Here you can choose the subsystem to which the device belongs	PV	PV power plant	–
		Load	Electrical loads	
		Genset	Gensets	
		Grid	Utility grid	
Select a measurement point	Add device at which measurements should be taken (e.g. load)	–	–	–
Selected measurement points	Remove device at which measurements are no longer required (e.g load)	–	–	–

Requirement:

☐ You must be logged in as **Installer**.

Procedure:

1. Choose the menu **Configuration Wizard** via the page and menu selection.
2. In the **Measurement System** bar, press [**Adjust**].
3. Set the parameters in the menu **Measurement devices general configuration** (see Section 4.8.3, page 19).
4. Press [**Continue wizard**].
5. Set the parameters in the menu **Measurement Devices configuration Wizard** (see Section 4.8.3, page 19).
6. To add a device, perform the following steps:
   - Choose the appropriate subsystem via **Select a Subsystem**.
   - Choose the appropriate device (e.g., a load) via **Select a measurement point**.
   - Press [**Add**].
   - Press [**Apply**].
7. To remove a device, perform the following steps:
   - Choose the appropriate device (e.g., a load) via **Selected measurement points**.
   - Press [**Remove**].
   - Press [**Apply**].
8. To continue with system settings, press [**Continue wizard**].
9. To end system settings, press [**Done**].

7.5 Configuring Stop of the Fuel Save Controller via Switch Input DI 7

The system settings of the Fuel Save Controller can only be adjusted when the Fuel Save Controller is in **STANDBY** or **ERROR** mode.

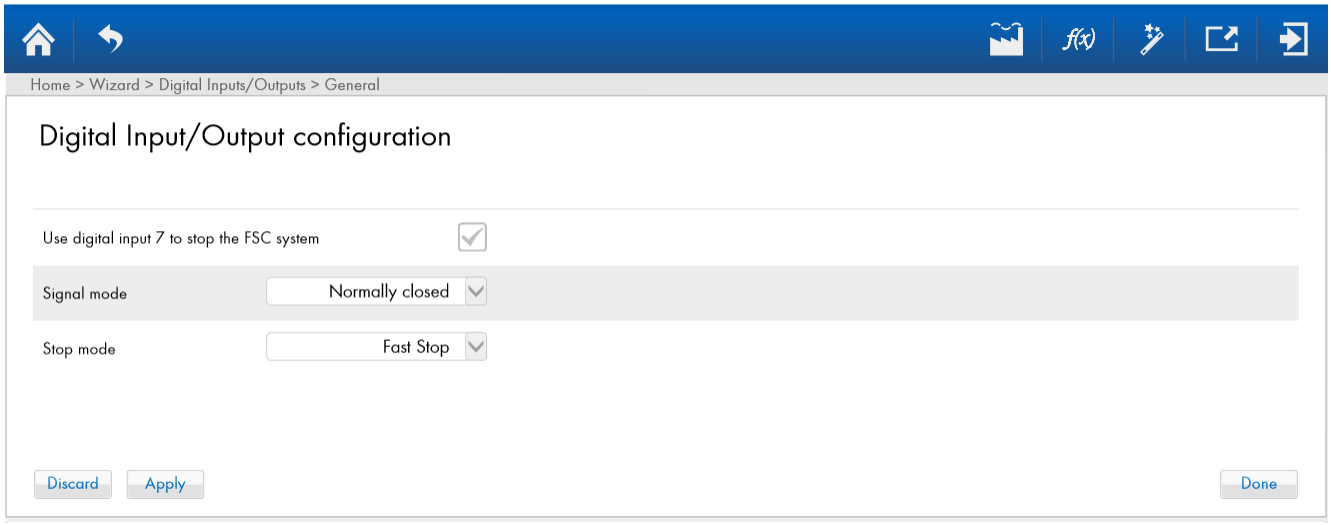


Figure 21: System settings for digital input and outputs

Parameter	Description	Value	Explanation	Default value
Use digital input 7 to stop the FSC system	Stop of Fuel Save Controller via switch input **DI 7***	Activated	Switch input DI 7 is used to stop the Fuel Save Controller. When this function is activated, the parameters **Signal mode** and **Stop mode** appear.	Activated
		Deactivated	Switch input DI 7 is not used to stop the Fuel Save Controller. The parameters **Signal mode** and **Stop mode** disappear.	
Signal mode	Tripping signal or switching procedure	Normally open	Tripping signal is activation of the connected signal generator.	Normally closed
		Normally closed	Tripping signal is deactivation of the connected signal generator.	
Stop mode	Stop mode	Fast stop	Fast stop: PV power plant is disconnected from the utility grid immediately.	Fast stop
		Slow Stop	Slow stop: the output power of the PV power plant is reduced gradually and then the PV power plant is disconnected from the grid.	

* To enable use of this function, switch input **DI 7** must be connected (see Fuel Save Controller installation manual).

NOTICE

Destruction of gensets due to insufficient reserve power

Once the SMA Fuel Save Controller and PV power plant have stopped, the PV power plant is no longer available as energy supplier. Now only the gensets supply the loads. If the current reserve power of the gensets is insufficient for supplying the power required by the loads, the gensets become overloaded Sustained overload of the gensets can result in failure of the power supply and destruction of the gensets.

- Check whether the current reserve power of the gensets is sufficient for supplying the power required by the loads.
- If the current reserve power of the gensets is insufficient, switch off the loads or connect additional gensets. This increases the reserve power of the gensets.
- If sufficient reserve power of the gensets cannot be ensured in operation, do not use the switch input **DI 7** of the Fuel Save Controller (Fast Stop contact of the PV power plant).

Requirement:

☐ You must be logged in as **Installer**.

Procedure:

1. Choose the menu **Configuration Wizard** via the page and menu selection.
2. To enable the stop of the Fuel Save Controller via switch input **DI 7**, activate checkbox **Use digital input 7 to stop the FSC system**.
3. To disable the stop of the Fuel Save Controller via switch input **DI 7**, deactivate checkbox **Use digital input 7 to stop the FSC system**.
4. If the checkbox **Use digital input 7 to stop the FSC system** is activated, configure the desired values for stopping the Fuel Save Controller via switch input **DI 7** in the dropdown lists **Signal mode** and **Stop mode**.

7.6 Handling Existing System Settings

7.6.1 Saving System Settings

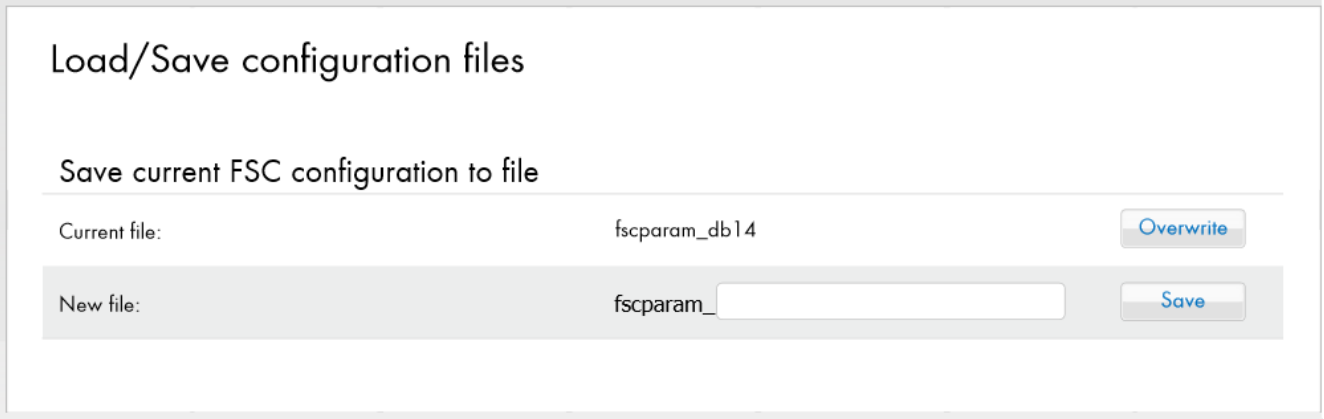


Figure 22: Saving system settings

The system settings of the Fuel Save Controller are saved in parameter files. You can overwrite the current parameter file or create a new parameter file.

The system settings of the Fuel Save Controller can only be saved, loaded or deleted when the Fuel Save Controller is in **STANDBY** or **ERROR** mode.

Requirement:

☐ You must be logged into the user interface as **Installer**.

Maximum number of parameter files

It is possible to save up to ten different system settings in parameter files.

- Once this number is reached, delete parameter files (see Section 7.6.3, page 51).

Procedure:

1. Choose the menu **Parameter Files** via the page and menu selection.
2. To overwrite the current parameter file, press the button [**Overwrite**] in the bar **Current file**.
3. To create a new parameter file, perform the following steps:
   - Enter the desired parameter name in the input field **fscparam_** in the bar **New file** and press Enter.
     By pressing Enter, the entered value is adopted in the user interface of the Fuel Save Controller.
   - Press the [**Save**] button.

7.6.2 Loading System Settings

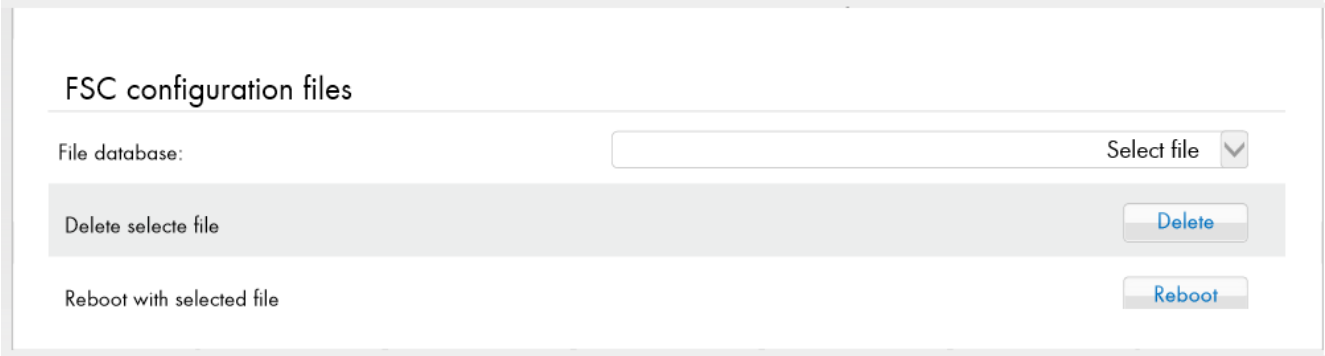


Figure 23: Loading or deleting system settings

The system settings of the Fuel Save Controller can only be saved, loaded or deleted when the Fuel Save Controller is in **STANDBY** or **ERROR** mode.

Requirements:

☐ You must be logged into the user interface as **Installer**.

☐ The SMA Fuel Save Controller and PV power plant must have been stopped (see Section 10.1, page 65).

NOTICE

Power supply failure when the SMA Fuel Save Controller is restarted

Before restarting the SMA Fuel Save Controller, the SMA Fuel Save Controller and PV power plant must be stopped. It can take a few minutes for the SMA Fuel Save Controller and PV power plant to stop because the PV inverters have to reduce their output power slowly. If the PV inverters are still feeding energy to the grid when the SMA Fuel Save Controller is restarted, this may cause failure of the power supply.

- Once the SMA Fuel Save Controller has stopped, wait until the PV inverters have reduced their output power to zero. This can take several minutes.

Procedure:

1. Choose the menu **Parameter Files** via the page and menu selection.
2. Choose the parameter file with the required system settings via the dropdown list **File database**.
3. In the bar **Reboot with a selected file**, press [**Reboot**].

7.6.3 Deleting System Settings

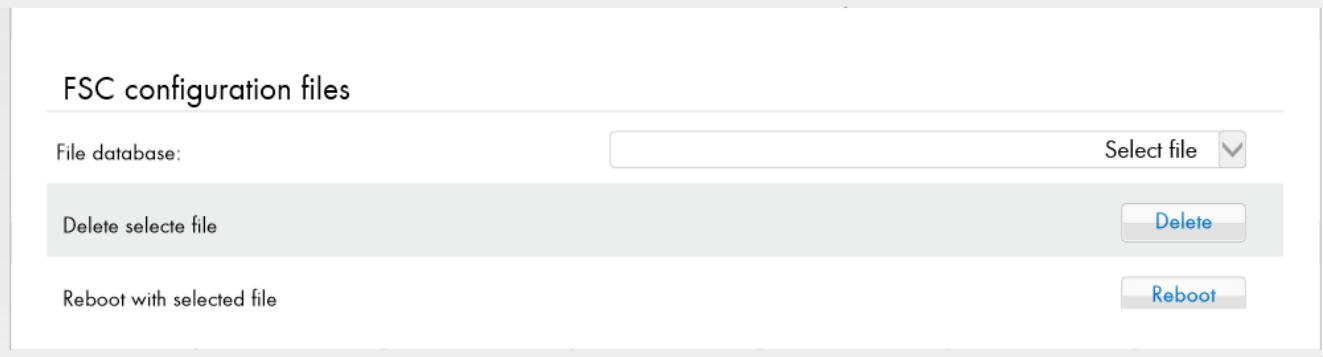


Figure 24: Loading or deleting system settings

The system settings of the Fuel Save Controller can only be saved, loaded or deleted when the Fuel Save Controller is in **STANDBY** or **ERROR** mode.

Requirement:

☐ You must be logged into the user interface as **Installer**.

Procedure:

1. Choose the menu **Parameter Files** via the page and menu selection.
2. Choose the parameter file with the required system settings via the dropdown list **File database**.
3. In the bar **Delete selected file**, press [**Delete**].

8 System Control

8.1 Configuring the Minimum Genset Load Threshold

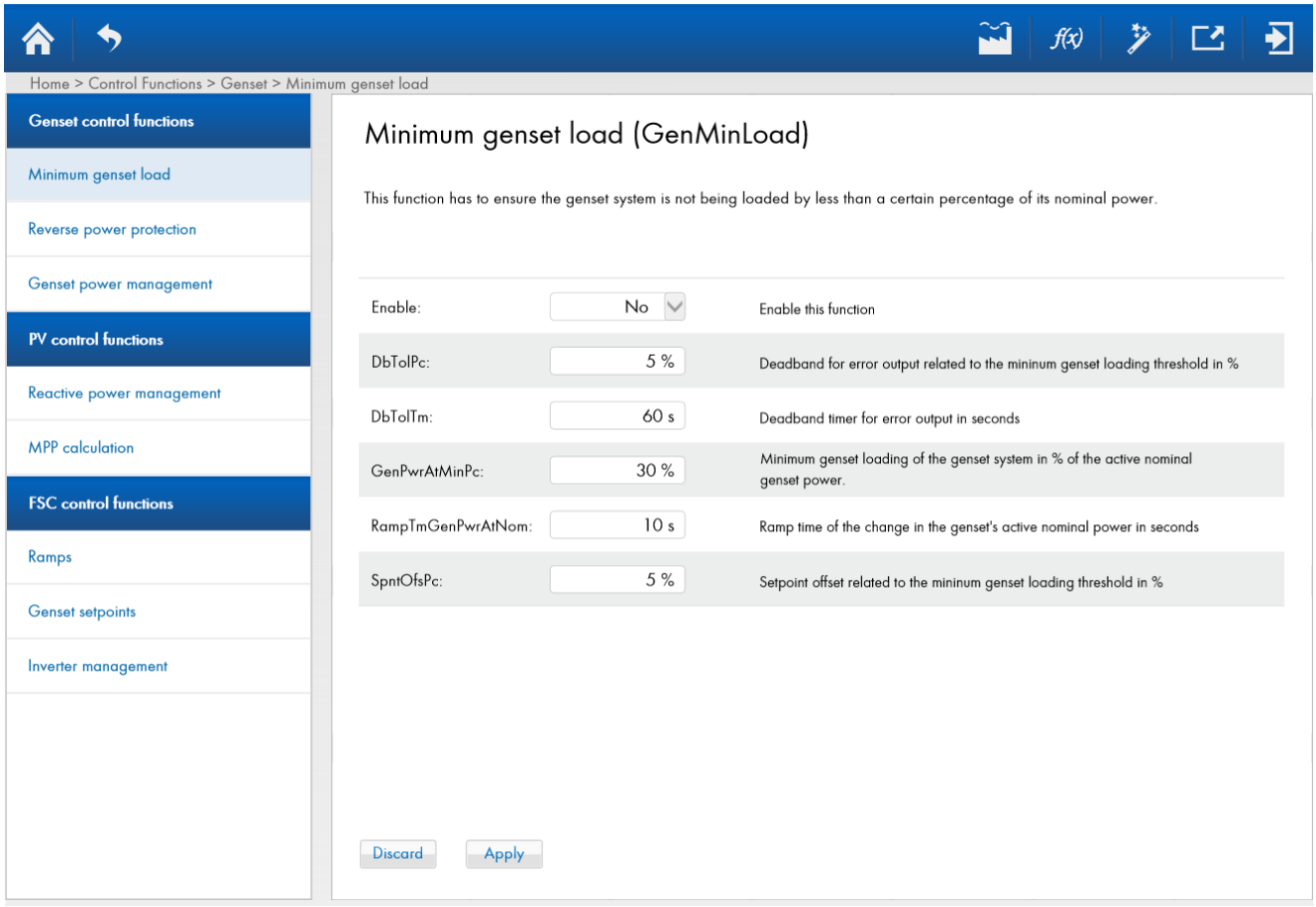

Home > Control Functions > Genset > Minimum genset load
Genset control functions
Minimum genset load
Reverse power protection
Genset power management
PV control functions
Reactive power management
MPP calculation
FSC control functions
Ramps
Genset setpoints
Inverter management
Minimum genset load (GenMinLoad)
This function has to ensure the genset system is not being loaded by less than a certain percentage of its nominal power.
Enable: No Enable this function
DbTolPc: 5 % Deadband for error output related to the mininum genset loading threshold in %
DbTolTm: 60 s Deadband timer for error output in seconds
GenPwrAtMinPc: 30 % Minimum genset loading of the genset system in % of the active nominal genset power.
RampTmGenPwrAtNom: 10 s Ramp time of the change in the genset's active nominal power in seconds
SpntOfsPc: 5 % Setpoint offset related to the mininum genset loading threshold in %
Discard
Apply

Figure 25: Settings for the minimum genset load

Parameter overview

Parameter	Description	Value	Explanation	Default value
Enable	Enable this function.	Yes	Activates the function	Yes
		No	Deactivates the function	
DbTolPc	Deadband for error output related to the minimum genset loading threshold in %.	−100 % ... 100 %	–	5 %
DbTolTm	Deadband timer for error output in seconds	0.1 s to 3,600 s	–	60 s
GenPwrAtMinPc	Minimum genset loading of the genset system in % of the nominal genset active power	0 % ... 100 %	–	30 %

Parameter	Description	Value	Explanation	Default value
RamPTmGenPwrAtNom	Ramp time of the change in the nominal genset active power in seconds	1 s to 60 s	–	10 s
SpntOfsPc	Setpoint offset related to the minimum genset loading threshold in %	−100 % ... 100 %	–	5 %

Requirement:

☐ You must be logged in as **Installer**.

Procedure:

1. Go to **Control Functions > Genset control function > Minimum genset load** via the page and menu selection.
2. Set the desired parameters (see Section 4.8.3, page 19).

8.2 Configuring Reverse Power Protection of the Gensets

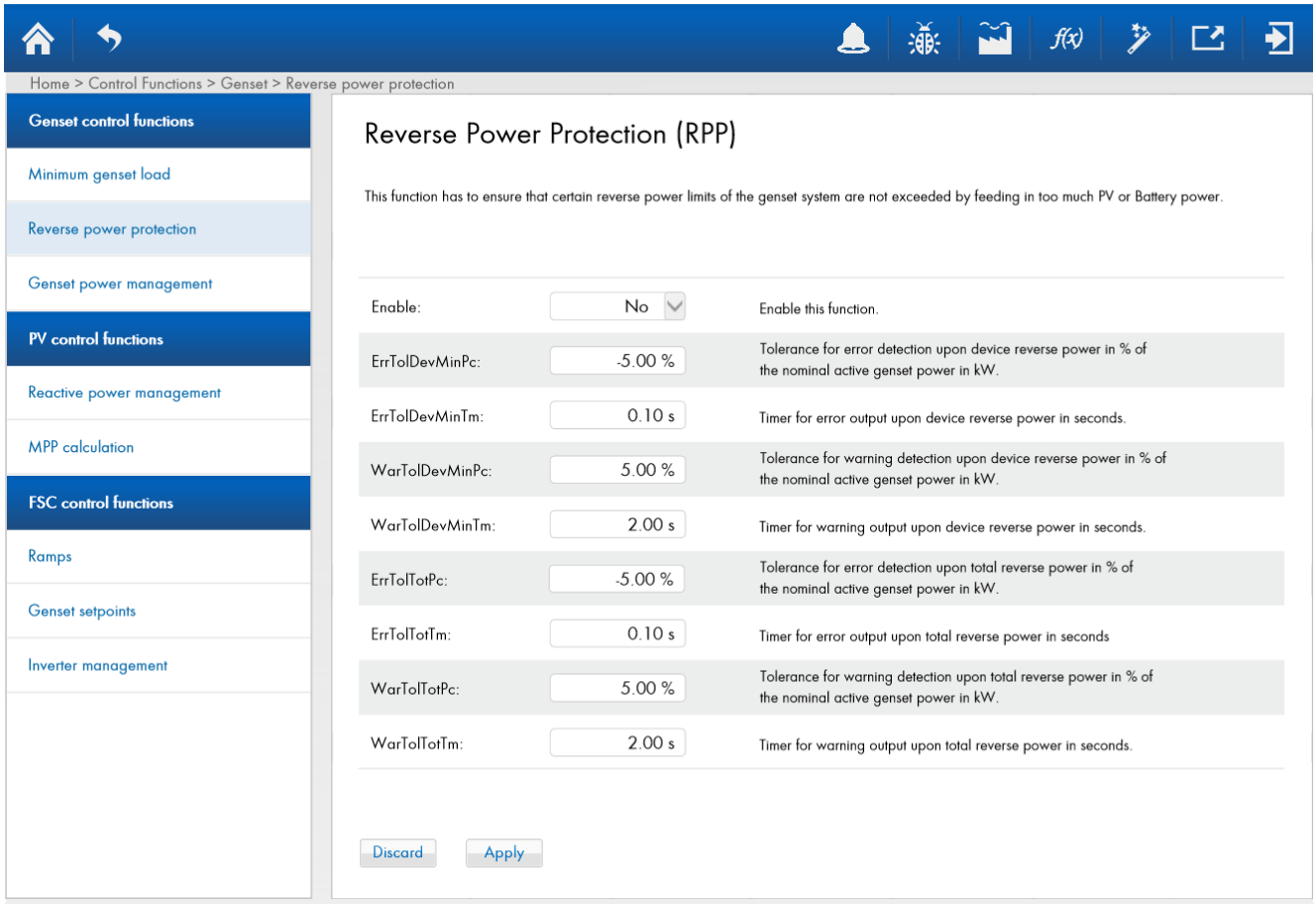

Home > Control Functions > Genset > Reverse power protection
Genset control functions
Minimum genset load
Reverse power protection
Genset power management
PV control functions
Reactive power management
MPP calculation
FSC control functions
Ramps
Genset setpoints
Inverter management
Reverse Power Protection (RPP)
This function has to ensure that certain reverse power limits of the genset system are not exceeded by feeding in too much PV or Battery power.
Enable: No Enable this function.
ErrTolDevMinPc: -5.00 % Tolerance for error detection upon device reverse power in % of the nominal active genset power in kW.
ErrTolDevMinTm: 0.10 s Timer for error output upon device reverse power in seconds.
WarTolDevMinPc: 5.00 % Tolerance for warning detection upon device reverse power in % of the nominal active genset power in kW.
WarTolDevMinTm: 2.00 s Timer for warning output upon device reverse power in seconds.
ErrTolTotPc: -5.00 % Tolerance for error detection upon total reverse power in % of the nominal active genset power in kW.
ErrTolTotTm: 0.10 s Timer for error output upon total reverse power in seconds
WarTolTotPc: 5.00 % Tolerance for warning detection upon total reverse power in % of the nominal active genset power in kW.
WarTolTotTm: 2.00 s Timer for warning output upon total reverse power in seconds.
Discard
Apply

Figure 26: Settings for reverse power protection of the gensets

Parameter overview

Parameter	Description	Value	Explanation	Default value
Enable	Enable this function.	Yes	Activates the function	Yes
		No	Deactivates the function	
ErrTolDevMinPc	Tolerance for error detection upon device reverse power in % of the nominal active genset power in kW	−100 % ... +100	–	−5 %
ErrTolDevMinTm	Timer for error output upon device reverse power in seconds.	0.1 s to 60 s	–	0.1 s
WarTolDevMinPc	Tolerance for warning detection upon device reverse power in % of the nominal active genset power in kW	−100 % ... +100	–	5 %
WarTolDevMinTm	Timer for warning output upon device reverse power in seconds	0.1 s to 60 s	–	2 s
ErrTolTotPc	Tolerance for error detection upon total reverse power in % of the nominal active genset power in kW	−100 % ... +100	–	−5 %
ErrTolTotTm	Timer for error output upon total reverse power in seconds	0.1 s to 60 s	–	0.1 s
WarTolTotPc	Tolerance for warning detection upon total reverse power in % of the nominal active genset power in kW	−100 % ... +100	–	5 %
WarTolTotTm	Timer for warning output upon total reverse power in seconds	0.1 s to 60 s	–	2 s

Requirement:

☐ You must be logged in as **Installer**.

NOTICE

Power supply failure caused by unexpected stop of a genset due to reverse power protection

To ensure that a genset is protected from backfeed damage, reverse power protection must be enabled and configured in the Fuel Save Controller and the genset. The parameters on the Fuel Save Controller and the genset must be configured so that the reverse power protection is always triggered at the Fuel Save Controller first. If the reverse power protection first triggers in the genset, this results in an unexpected stop of the genset which cannot be foreseen by the Fuel Save Controller. The unexpected stop of a genset may result in a power failure in the entire PV diesel hybrid system.

- Only use gensets with reverse power protection which fulfill the reverse power limits of the Fuel Save Controller (see installation manual of the SMA Fuel Save Controller).
- Ensure that the reverse power protection of the gensets is always active when operating the Fuel Save Controller.
- Adjust the reverse power protection parameters to ensure that reverse power protection always triggers first at the Fuel Save Controller and only then at the genset.

Procedure:

1. Go to **Control Functions > Genset control function > Reverse power management** via the page and menu selection.
2. Set the desired parameters (see Section 4.8.3, page 19).

8.3 Configuring Power Management for Gensets

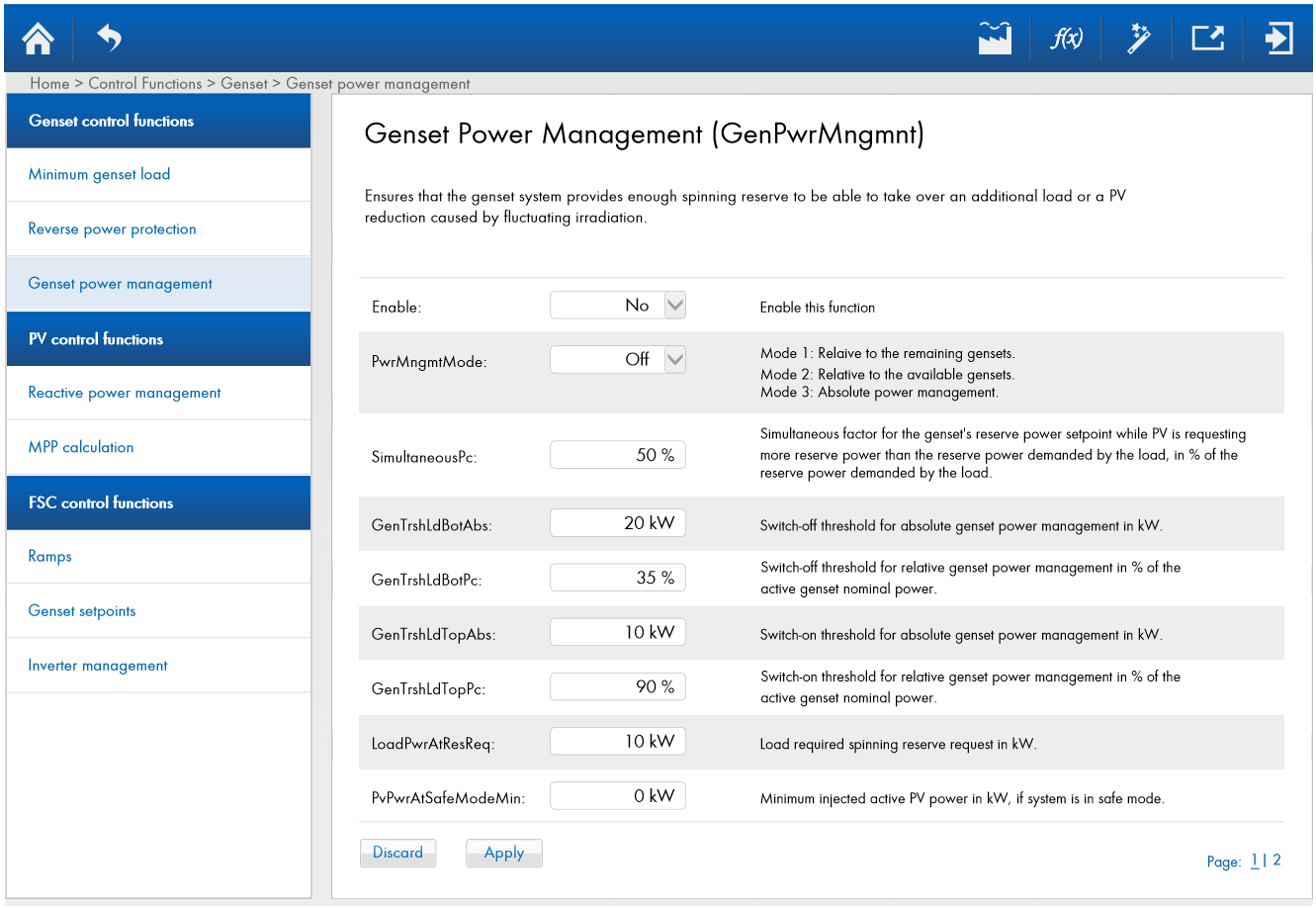

Home > Control Functions > Genset > Genset power management
Genset control functions
Minimum genset load
Reverse power protection
Genset power management
PV control functions
Reactive power management
MPP calculation
FSC control functions
Ramps
Genset setpoints
Inverter management
Genset Power Management (GenPwrMngmnt)
Ensures that the genset system provides enough spinning reserve to be able to take over an additional load or a PV reduction caused by fluctuating irradiation.
Enable: No Enable this function
PwrMngmtMode: Off Mode 1: Relaive to the remaining gensets. Mode 2: Relative to the available gensets. Mode 3: Absolute power management.
SimultaneousPc: 50 % Simultaneous factor for the genset's reserve power setpoint while PV is requesting more reserve power than the reserve power demanded by the load, in % of the reserve power demanded by the load.
GenTrshLdBotAbs: 20 kW Switch-off threshold for absolute genset power management in kW.
GenTrshLdBotPc: 35 % Switch-off threshold for relative genset power management in % of the active genset nominal power.
GenTrshLdTopAbs: 10 kW Switch-on threshold for absolute genset power management in kW.
GenTrshLdTopPc: 90 % Switch-on threshold for relative genset power management in % of the active genset nominal power.
LoadPwrAtResReq: 10 kW Load required spinning reserve request in kW.
PvPwrAtSafeModeMin: 0 kW Minimum injected active PV power in kW, if system is in safe mode.
Discard
Apply
Page: 1 | 2

Figure 27: Power management of gensets: settings for reserve power

Parameter overview

Parameter	Description	Value	Explanation	Default value
Enable	Enable this function.	Yes	Activates the function	Yes
		No	Deactivates the function	
PwrMngmtMode	Select mode for power management	Off	Off	Off
		Relative to the remaining gensets	Relative power management of gensets as a percentage of the active genset load: in case of switch-off, the remaining nominal power of the gensets after switch-off is taken into account.	
		Relative to the available gensets	Relative power management of gensets as a percentage of the active genset load: in case of switch-off, the nominal power of the currently available gensets is taken into account.	
		Absolute Power Management	Absolute power management of gensets to comply with a specified absolute reserve power of the total system in kW.	
SimultaneousPC	Simultaneous factor for the genset's reserve power setpoint while PV power plant is requesting more reserve power than the reserve power demanded by the load, in % of the reserve power demanded by the load	0 % ... 100 %	–	50 %
GenTrshLdBotAbs	Switch-off threshold for absolute genset power management in kW	0 kW to 100,000 kW	–	20 kW
GenTrshLdBotPc	Switch-off threshold for relative genset power management in relation to the active genset nominal power in %	0% ... 90 %	–	35 %

Parameter	Description	Value	Explanation	Default value
GenTrshLdTopAbs	Switch-on threshold for absolute genset power management in kW	0 kW to 100,000 kW	–	10 kW
GenTrshLdTopPc	Switch-on threshold for relative genset power management in % of the /n active genset nominal power.	10 % ... 110 %	–	90 %
LoadPwrAtResReq	Load-dependent spinning reserve request in kW	0 kW to 100,000 kW	–	10 kW
PvPwrAtSafeModeMin	Minimum injected active PV power in kW, if system is in safe mode.	0 kW to 100,000 kW	–	0 kW

Requirement:

☐ You must be logged in as **Installer**.

NOTICE

Destruction of gensets due to insufficient reserve power

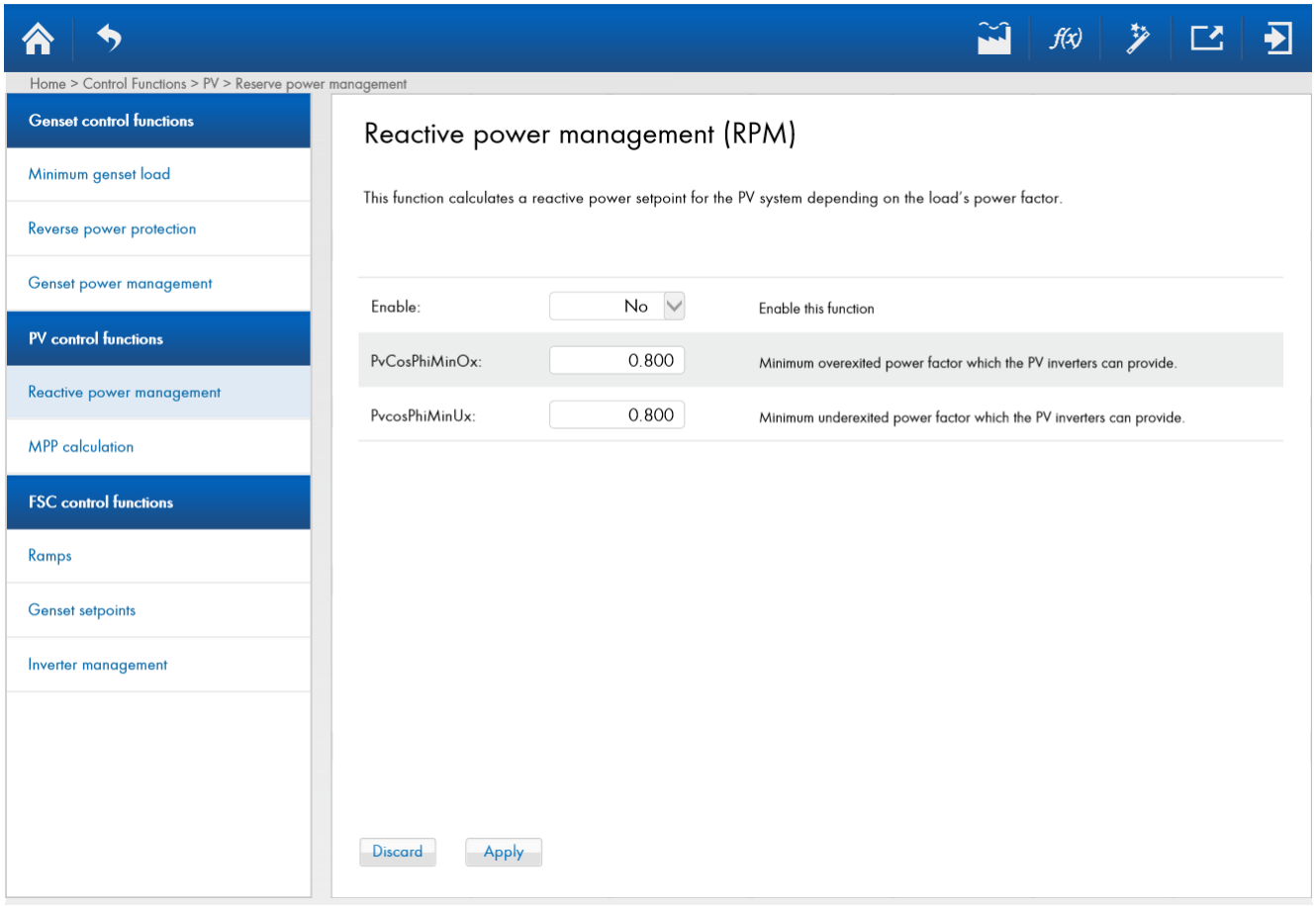
Once the SMA Fuel Save Controller and PV power plant have stopped, the PV power plant is no longer available as energy supplier. Now only the gensets supply the loads. If the current reserve power of the gensets is insufficient for supplying the power required by the loads, the gensets become overloaded Sustained overload of the gensets can result in failure of the power supply and destruction of the gensets.

- Prior to stopping the Fuel Save Controller, always check whether the current reserve power of the gensets is sufficient to cover the requirement of the loads.
  - If the current reserve power of the gensets is insufficient, switch off the loads or connect additional gensets. This increases the reserve power of the gensets.
- If the power management and the communication interface of the genset is not compatible with the Fuel Save Controller, power management must be deactivated on the Fuel Save Controller. In this case, the gensets must be monitored to ensure that sufficient reserve power is retained.
- Make sure that the setpoints for power management on the Fuel Save Controller and the gensets are set to the same value.

Procedure:

1. Go to **Control Functions > Genset control function > Genset power management** via the page and menu selection.
2. Set the desired parameters (see Section 4.8.3, page 19).

8.4 Configuring Reactive Power for PV Power Plant



Parameter overview

Parameter	Description	Value	Explanation	Default value
Enable	Enable this function.	Yes	Activates the function	Yes
		No	Deactivates the function	
PvCosPhiMinOx	Minimum overexcited power factor which the PV inverters can provide	0 ... 1	–	0.8
PvCosPhiMinUx	Minimum underexcited power factor which the PV inverters can provide.	0 ... 1	–	0.8

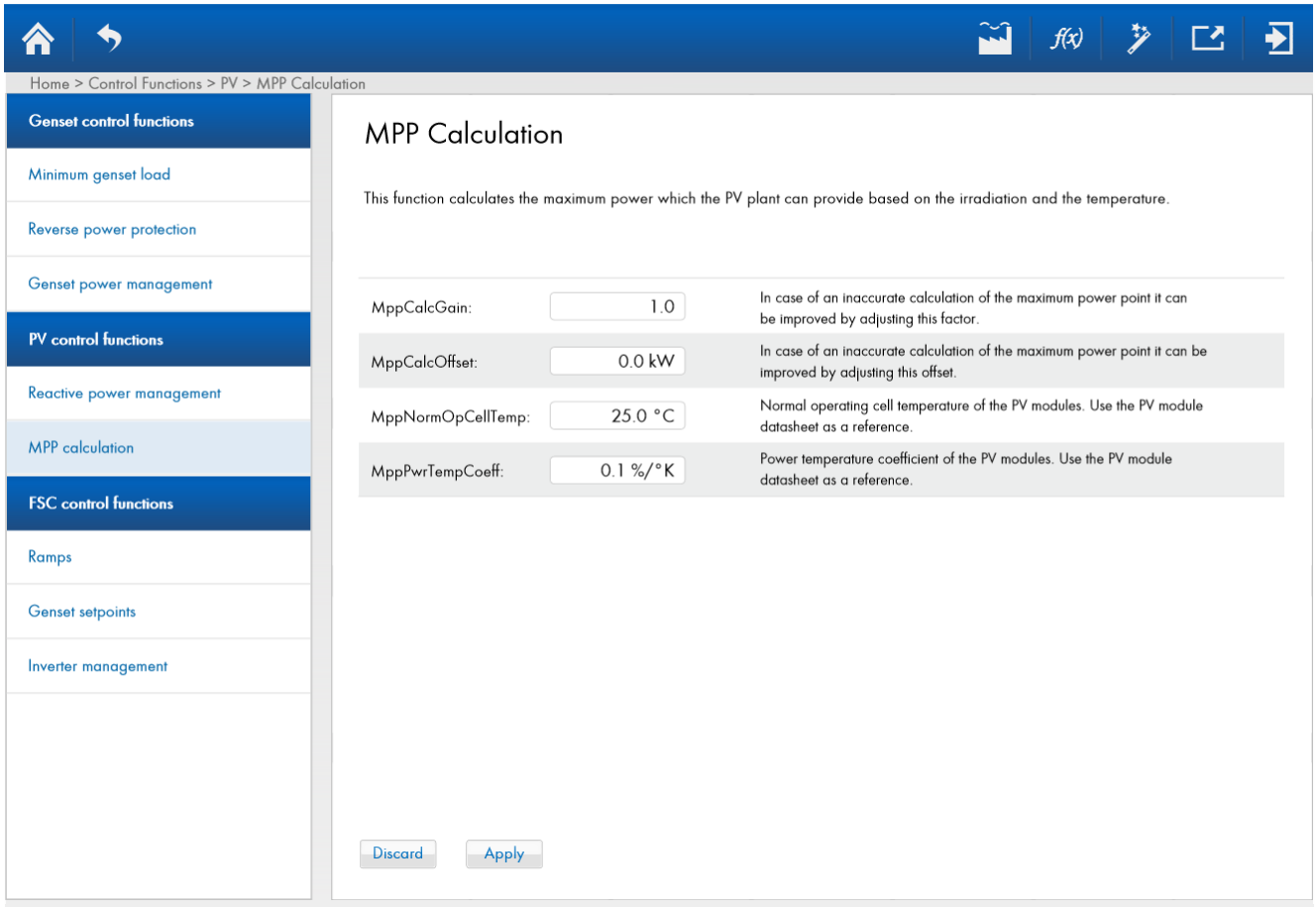
Requirement:

☐ You must be logged in as **Installer**.

Procedure:

1. Go to **Control Functions > PV control functions > Reactive power management** via the page and menu selection.
2. Set the desired parameters (see Section 4.8.3, page 19).

8.5 Configuring MPP Calculation for PV Power Plant


Home > Control Functions > PV > MPP Calculation
Genset control functions
Minimum genset load
Reverse power protection
Genset power management
PV control functions
Reactive power management
MPP calculation
FSC control functions
Ramps
Genset setpoints
Inverter management
MPP Calculation
This function calculates the maximum power which the PV plant can provide based on the irradiation and the temperature.
MppCalcGain: 1.0
In case of an inaccurate calculation of the maximum power point it can be improved by adjusting this factor.
MppCalcOffset: 0.0 kW
In case of an inaccurate calculation of the maximum power point it can be improved by adjusting this offset.
MppNormOpCellTemp: 25.0 °C
Normal operating cell temperature of the PV modules. Use the PV module datasheet as a reference.
MppPwrTempCoeff: 0.1 %/°K
Power temperature coefficient of the PV modules. Use the PV module datasheet as a reference.
Discard
Apply

Parameter overview

Parameter	Description	Value	Default value
MppCalcGain	In case of an inaccurate calculation of the maximum power point, it can be improved by adjusting this factor.	−1,000 ... +1,000	1
MppCalcOffset	In case of an inaccurate calculation of the maximum power point, it can be improved by adjusting this offset.	−100,000 ... +100,000	0
MppNormOpCel-lTemp	Normal operating cell temperature of the PV modules. Use the PV module datasheet as a reference.	−100°C to +100°C	25°C
MppPwrTempCoeff	Power temperature coefficient of the PV modules. Use the PV module datasheet as a reference.	−10 %/°C to +10 %/°C	0.1% /°C

Requirement:

☐ You must be logged in as **Installer**.

Procedure:

1. Go to **Control Functions > PV control functions > MPP calculation** via the page and menu selection.
2. Set the desired parameters (see Section 4.8.3, page 19).

8.6 Configuring Setpoint Change Rate for PV inverters and Gensets

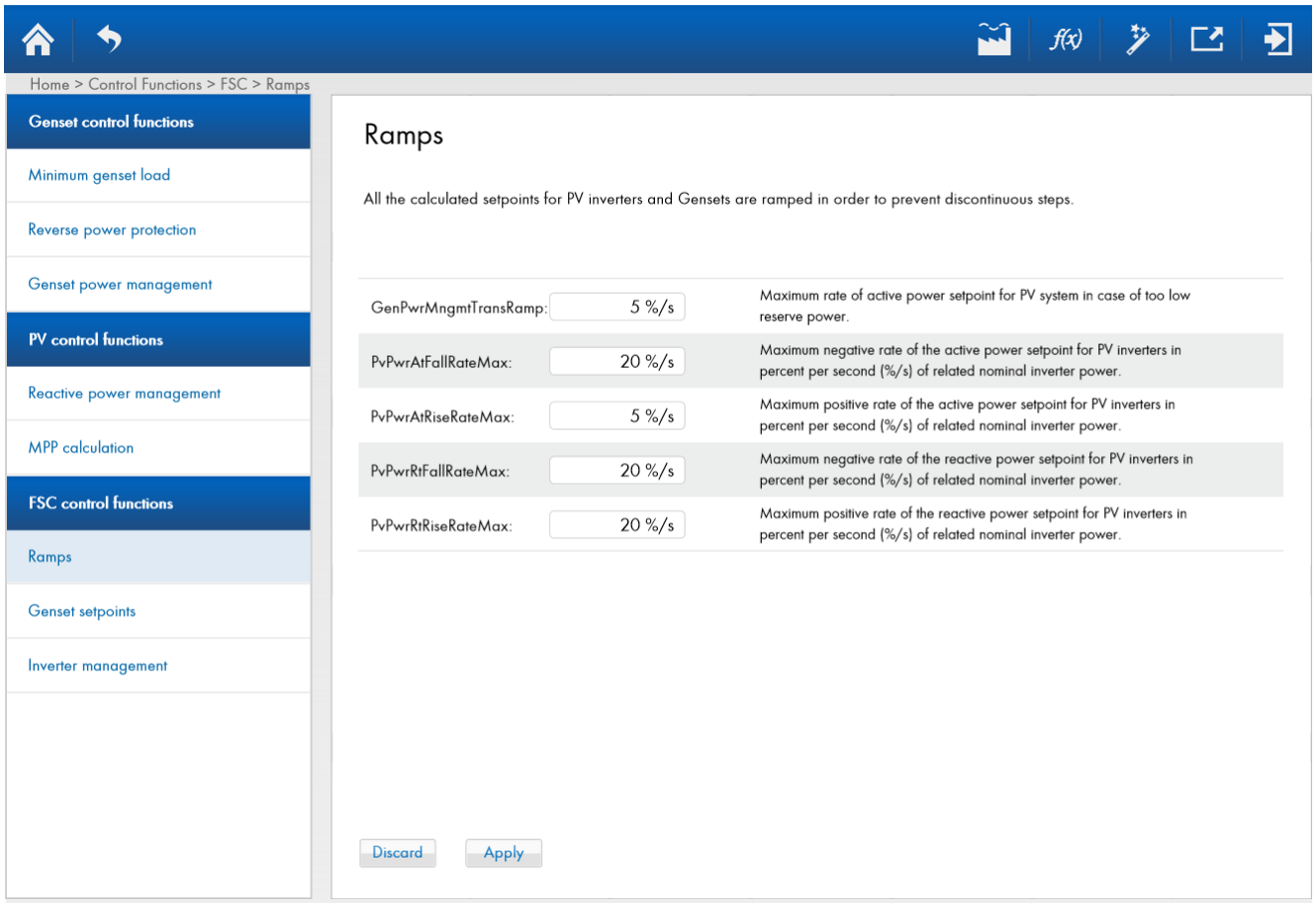

Home > Control Functions > FSC > Ramps
Genset control functions
Minimum genset load
Reverse power protection
Genset power management
PV control functions
Reactive power management
MPP calculation
FSC control functions
Ramps
Genset setpoints
Inverter management
Ramps
All the calculated setpoints for PV inverters and Gensets are ramped in order to prevent discontinuous steps.
GenPwrMngmtTransRamp: 5 %/s
Maximum rate of active power setpoint for PV system in case of too low reserve power.
PvPwrAtFallRateMax: 20 %/s
Maximum negative rate of the active power setpoint for PV inverters in percent per second (%/s) of related nominal inverter power.
PvPwrAtRiseRateMax: 5 %/s
Maximum positive rate of the active power setpoint for PV inverters in percent per second (%/s) of related nominal inverter power.
PvPwrRtFallRateMax: 20 %/s
Maximum negative rate of the reactive power setpoint for PV inverters in percent per second (%/s) of related nominal inverter power.
PvPwrRtRiseRateMax: 20 %/s
Maximum positive rate of the reactive power setpoint for PV inverters in percent per second (%/s) of related nominal inverter power.
Discard
Apply

Figure 28: Settings for the setpoint change rate for inverters and gensets

Parameter overview

Parameter	Description	Value	Default value
GenPwrMngmtTran-sRamp	Maximum rate of active power setpoint for PV system in case of too low reserve power.	0 % ... 100 %	5 %
PvPwrAtFallRateMax	Maximum negative rate of the active power setpoint for PV inverters in percent per sec-ond (%/s) of related nominal inverter power	0 % ... 1,000 %	20 %
PvPwrAtRiseRateMax	Maximum positive rate of the active power setpoint for PV inverters in percent per sec-ond (%/s) of related nominal inverter power	0 % ... 1,000 %	5 %
PvPwrRtFallRateMax	Maximum negative rate of the active power setpoint for PV inverters in percent per sec-ond (%/s) of related nominal inverter power	0 % ... 1,000 %	20 %
PvPwrRtRiseRateMax	Maximum positive rate of the reactive power setpoint for PV inverters in percent per sec-ond (%/s) of related nominal inverter power.	0 % ... 1,000 %	20 %

Requirement:

☐ You must be logged in as **Installer**.

Procedure:

1. Go to **Control Functions > FSC control function > Ramps** via the page and menu selection.
2. Set the desired parameters (see Section 4.8.3, page 19).

8.7 Options for Specifying the Reserve Power Setpoint of the Gensets

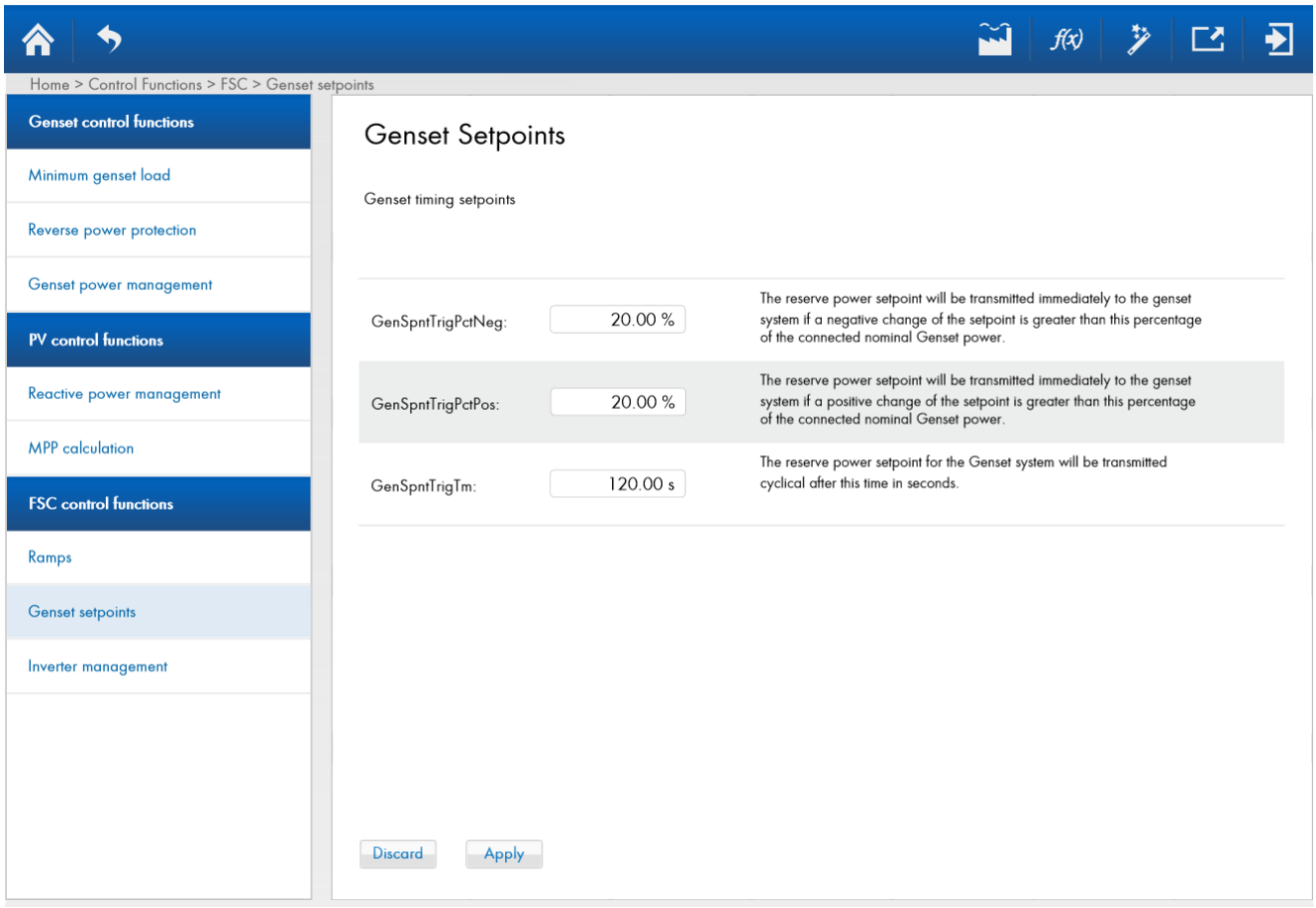

Home > Control Functions > FSC > Genset setpoints
Genset control functions
Minimum genset load
Reverse power protection
Genset power management
PV control functions
Reactive power management
MPP calculation
FSC control functions
Ramps
Genset setpoints
Inverter management
Genset Setpoints
Genset timing setpoints
GenSpntTrigPctNeg:
20.00 %
The reserve power setpoint will be transmitted immediately to the genset system if a negative change of the setpoint is greater than this percentage of the connected nominal Genset power.
GenSpntTrigPctPos:
20.00 %
The reserve power setpoint will be transmitted immediately to the genset system if a positive change of the setpoint is greater than this percentage of the connected nominal Genset power.
GenSpntTrigTm:
120.00 s
The reserve power setpoint for the Genset system will be transmitted cyclical after this time in seconds.
Discard
Apply

Figure 29: Specification of setpoints for gensets

Parameter overview

Parameter	Description	Value	Default value
GenSpntTrigPctNeg	The reserve power setpoint will be transmitted immediately to the genset system if a negative change of the setpoint is greater than this percentage of the connected nominal Genset power.	0 % ... 10,000 %	20 %
GenSpntTrigPctPos	The reserve power setpoint will be transmitted immediately to the genset system if a positive change of the setpoint is greater than this percentage of the connected nominal Genset power.	0 % ... 10,000 %	20 %
GenSpntTrigTm	The reserve power setpoint for the Genset system will be transmitted /n cyclical after this time in seconds.	0.1 s to 3,600 s	120 s

Requirement:

☐ You must be logged in as **Installer**.

Procedure:

1. Go to **Control Functions > FSC control function > Genset setpoints** via the page and menu selection.
2. Set the desired parameters (see Section 4.8.3, page 19).

8.8 Configuring PV Power Plant Management

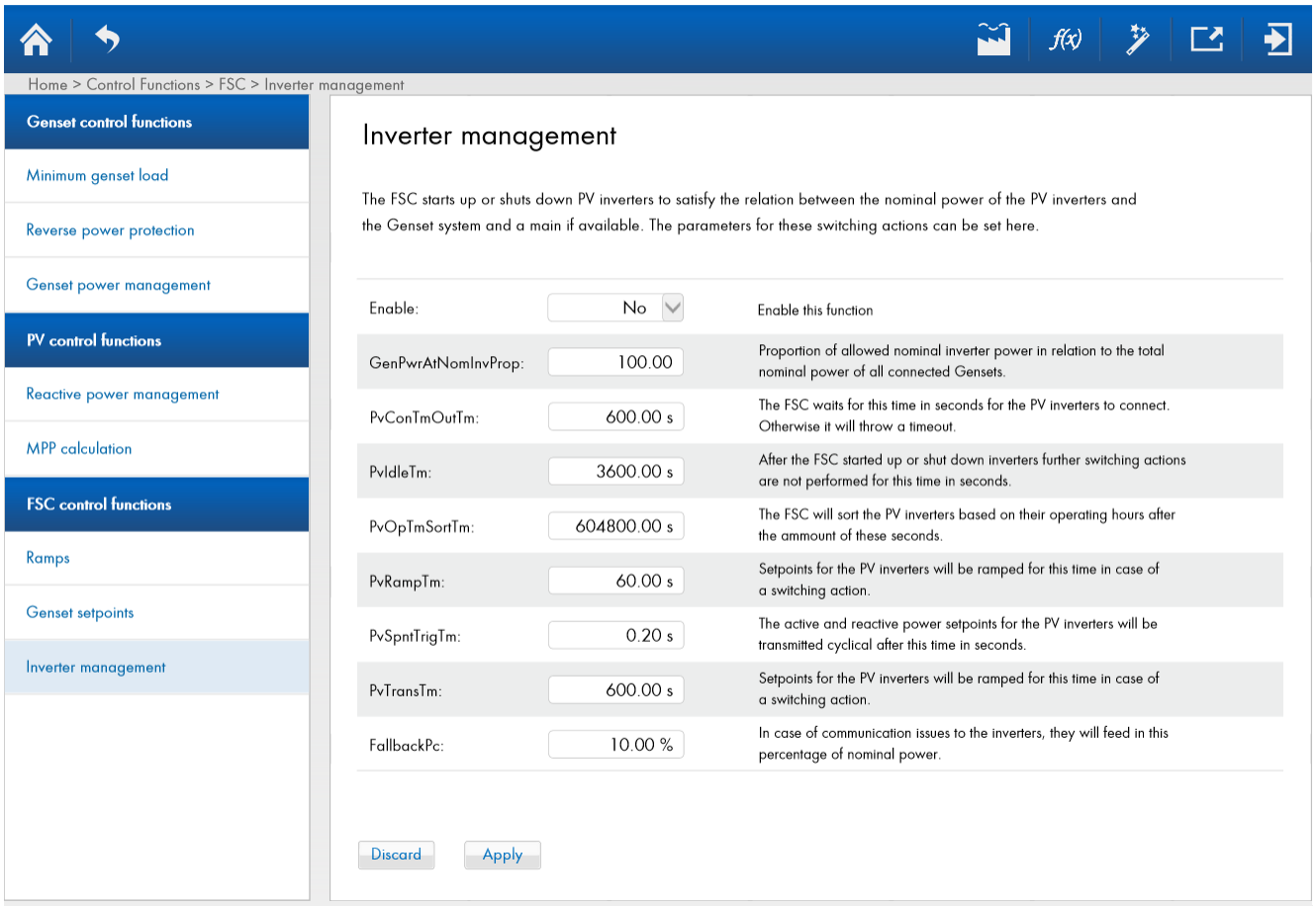

Home > Control Functions > FSC > Inverter management
Genset control functions
Minimum genset load
Reverse power protection
Genset power management
PV control functions
Reactive power management
MPP calculation
FSC control functions
Ramps
Genset setpoints
Inverter management
Inverter management
The FSC starts up or shuts down PV inverters to satisfy the relation between the nominal power of the PV inverters and the Genset system and a main if available. The parameters for these switching actions can be set here.
Enable: No
Enable this function
GenPwrAtNomInvProp: 100.00
Proportion of allowed nominal inverter power in relation to the total nominal power of all connected Gensets.
PvConTmOutTm: 600.00 s
The FSC waits for this time in seconds for the PV inverters to connect. Otherwise it will throw a timeout.
PvIdleTm: 3600.00 s
After the FSC started up or shut down inverters further switching actions are not performed for this time in seconds.
PvOpTmSortTm: 604800.00 s
The FSC will sort the PV inverters based on their operating hours after the ammount of these seconds.
PvRampTm: 60.00 s
Setpoints for the PV inverters will be ramped for this time in case of a switching action.
PvSpntTrigTm: 0.20 s
The active and reactive power setpoints for the PV inverters will be transmitted cyclical after this time in seconds.
PvTransTm: 600.00 s
Setpoints for the PV inverters will be ramped for this time in case of a switching action.
FallbackPc: 10.00 %
In case of communication issues to the inverters, they will feed in this percentage of nominal power.
Discard
Apply

Figure 30: Management of the PV power plant: Switching inverters on and off

Parameter overview

Parameter	Description	Value	Explanation	Default value
Enable	Enable this function.	Yes	Activates the function	Yes
		No	Deactivates the function	
GenPwrAtNomInvProp	Proportion of allowed nominal inverter power in relation to the total nominal power of all connected Gensets	0 % ... 1,000 %	–	100 %

Parameter	Description	Value	Explanation	Default value
PvConTmOutTm	The FSC waits for this time in seconds for the PV inverters to connect. Otherwise it will throw a timeout.	10 s to 86,400 s	–	600 s
PvIdleTm	After the FSC has started up or shut down inverters, further switching actions are not performed for this time in seconds.	0 s to 86,400 S	–	60 s
PvOpTmSortTm	The FSC will sort the PV inverters based on their operating hours after the given number of seconds.	at least 3,600 s	–	604,800 s
PvRampTm	Setpoints for the PV inverters will be ramped for this time in case of switching action.	1 s to 300 s	–	60 s
PvSpntTrigTm	The active and reactive power setpoints for the PV inverters will be transmitted cyclical after this time in seconds.	0.1 s to 3,600 s	–	0.2 s
PvTransTm	Setpoints for the PV inverters will be ramped for this time in case of switching action.	1 s to 604,800 s	–	600 s
FallbackPc	In case of communication issues to the inverters, they will feed in this percentage of nominal power.	1 % ... 100 %	–	10 %

Requirement:

☐ You must be logged in as **Installer**.

NOTICE

Power outage due to sudden power fluctuations in the PV power plant

If the communication between the Fuel Save Controller and the inverters is interrupted, the inverters will operate according to their fallback settings. When communication is restored, power fluctuations may occur if the fallback settings of the inverters deviate from the fallback settings of the Fuel Save Controller. These power fluctuations can result in failure of the power supply in the PV diesel hybrid system.

- Ensure that the fallback settings of the inverters match the fallback settings of the Fuel Save Controller.

Procedure:

1. Go to **Control Functions > FSC control function > Inverter management** via the page and menu selection.
2. Set the desired parameters (see Section 4.8.3, page 19).

9 System History

9.1 Overview of the Data Structure

The SMA Fuel Save Controller records the system history and saves three files with different data each day:

- One file with data for fast acquisition of measured values
- One file with data for slow acquisition of measured values
- One file with event and error messages

Once the SMA Fuel Save Controller has recorded the system history for 100 days in a ring buffer, it starts to overwrite the files.

The files are saved in CSV format and recorded according to the following pattern:

File content	Name structure	Save interval	Path for open access	Read access for user group
Data for fast acquisition of measured values	LogDataFast_JJJJ-MM-TT.csv	10 s	/cfs0/fsc/log/DataFast/ ...	**User** and **Installer**
Data for slow acquisition of measured values	LogDataSlow_JJJJ-MM-TT.csv	300 s	/cfs0/fsc/log/DataSlow/ ...	**User** and **Installer**
Event and error messages	ErrEvtLog_JJJJ-MM-TT.csv	–	/cfs0/fsc/log/ErrEvt/ ...	only **Installer**
System settings	–	–	/cfs0/fsc/param/ ...	only **Installer**

9.2 Viewing System History Data

Requirements:

☐ To access the files, a file management program (e.g., Windows Explorer) or web browser (e.g., Google Chrome) must be installed.

☐ The file management program or web browser must have an FTP function.

☐ To open the files, a spreadsheet program or text editor must be installed.

Procedure:

1. Enter the IP address of the SMA Fuel Save Controller **ftp://172.16.1.21** in the address bar of the file management program or web browser.
2. Enter password(see Section 5.1 "Logging In and Out of the User Interface", page 21).
3. Enter the desired path (see Section 9.1 "Overview of the Data Structure", page 64).
4. Open the required file.

10 Starting and Stopping the System

10.1 Stopping the SMA Fuel Save Controller and PV Power Plant

The SMA Fuel Save Controller and PV power plant can be stopped in two ways:

- Stopping the SMA Fuel Save Controller and PV power plant using the switch cabinet key
- Stopping the SMA Fuel Save Controller and PV power plant via the user interface

NOTICE

Destruction of gensets due to insufficient reserve power

Once the SMA Fuel Save Controller and PV power plant have stopped, the PV power plant is no longer available as energy supplier. Now only the gensets supply the loads. If the current reserve power of the gensets is insufficient for supplying the power required by the loads, the gensets become overloaded Sustained overload of the gensets can result in failure of the power supply and destruction of the gensets.

- Prior to stopping the Fuel Save Controller, always check whether the current reserve power of the gensets is sufficient to cover the requirement of the loads.
  - If the current reserve power of the gensets is insufficient, switch off the loads or connect additional gensets. This increases the reserve power of the gensets.
- If the power management and the communication interface of the genset is not compatible with the Fuel Save Controller, power management must be deactivated on the Fuel Save Controller. In this case, the gensets must be monitored to ensure that sufficient reserve power is retained.
- Make sure that the setpoints for power management on the Fuel Save Controller and the gensets are set to the same value.

Stopping the SMA Fuel Save Controller and PV power plant using the switch cabinet key

1. Turn the SMA Fuel Save Controller key switch to **Stop**.
2. Wait until the SMA Fuel Save Controller has stopped the inverters. This can take several minutes.
3. To disconnect the inverters from the AC grid, disconnect the inverters from voltage sources (see inverter documentation).

Stopping the SMA Fuel Save Controller and PV power plant via the user interface

Requirement:

☐ You must be logged into the user interface as Installer.

Procedure:

1. Log into the user interface as **Installer**.
2. Choose **Settings > General** via the page and menu selection.
3. In the **Start/Stop FSC system** bar, press [**Stop FSC**].
4. Wait until the SMA Fuel Save Controller has stopped the inverters. This can take several minutes.
   ☑ The **Fuel Save Controller is off** message is displayed.
5. To disconnect the inverters from the AC grid, disconnect the inverters on the DC main distributor from voltage sources (see inverter documentation).

10.2 Starting the PV Power Plant and SMA Fuel Save Controller

1. Start the gensets (see system documentation).
2. Connect supply voltage to the SMA Fuel Save Controller (see Fuel Save Controller installation manual).

3. Connect the current and voltage measurement inputs (see Fuel Save Controller installation manual).
4. To start the PV power plant and SMA Fuel Save Controller using the switch cabinet key, turn the SMA Fuel Save Controller key switch to **Start**.
5. To start the PV power plant and SMA Fuel Save Controller via the user interface, carry out the following steps:
   - Log into the user interface as **Installer**.
   - Choose **Settings > General** via the page and menu selection.
   - In the **Start/Stop FSC system** bar, press [**Start FSC**].

   ☑ The **Fuel Save Controller is on** message is displayed.
6. Connect the PV inverters on the DC main distributor to the AC grid (see inverter documentation).

☑ The PV power plant synchronizes to the available AC grid. How long synchronization takes depends on the current solar irradiation on the PV modules and on the current power required by the loads.

10.3 Restarting the SMA Fuel Save Controller and PV Power Plant

Requirement:

☐ You must be logged into the user interface as **Installer**.

☐ The SMA Fuel Save Controller and PV power plant must have been stopped (see Section 10.1, page 65).

NOTICE

Power supply failure when the SMA Fuel Save Controller is restarted

Before restarting the SMA Fuel Save Controller, the SMA Fuel Save Controller and PV power plant must be stopped. It can take a few minutes for the SMA Fuel Save Controller and PV power plant to stop because the PV inverters have to reduce their output power slowly. If the PV inverters are still feeding energy to the grid when the SMA Fuel Save Controller is restarted, this may cause failure of the power supply.

- Once the SMA Fuel Save Controller has stopped, wait until the PV inverters have reduced their output power to zero. This can take several minutes.

Procedure:

1. Choose the menu **Plant Overview** via the page and menu selection.
2. Choose **Settings > General** via the page and menu selection.
3. In the **Reboot FSC system** bar, press [**Reboot**].

11 Cleaning

Additionally required maintenance material (not included in the scope of delivery):

☐ Use touch-up sticks, paint brushes, spray paint or 2K-PUR acrylic paint to repair minor surface damage.

☐ Use touch-up paint or 2K-PUR acrylic paint to repair extensive surface damage.

⚠ WARNING

Danger to life from electric shock due to live voltage

Danger of electric shock if work is executed incorrectly or under fault conditions. An electric shock can lead to death or serious injury.

- Disconnect the supply voltage and the measuring cables for the current- and voltage measurement before performing any work on the Fuel Save Controller.
- Observe the five safety rules when disconnecting the supply voltage:
  - Disconnect from voltage sources.
  - Ensure that the device cannot be reconnected.
  - Ensure that no voltage is present.
  - Ground and short-circuit the device.
  - Cover and isolate any adjacent live components.

NOTICE

Damage to the Fuel Save Controller due to moisture penetration

Penetrating moisture can cause short circuits and damage the Fuel Save Controller.

- Use a moist cloth to remove dust. Do not use solvents, abrasives or other corrosive substances.

Procedure:

1. Check whether the Fuel Save Controller shows any externally visible damage.

   If the Fuel Save Controller shows any externally visible damage, carry out the following measures:
   - Decommission the SMA Fuel Save Controller (see Fuel Save Controller installation manual).
   - Contact the SMA Service Line (see Section 12, page 68).
2. Remove coarse dirt contamination from the outside of the enclosure with a soft brush or similar tool.
3. Remove dust from the outside of the enclosure using a moist cloth.
4. Check the enclosure for corrosion and eliminate if necessary:
   - Use touch-up sticks, paint brushes, spray paint or, alternatively, 2K-PUR acrylic paint to repair minor surface damage. When doing so, adhere to the relevant instructions of the paint manufacturer.
   - Use touch-up paint or 2K-PUR acrylic paint to repair extensive surface damage. When doing so, adhere to the relevant instructions of the paint manufacturer.

12 Contact

If you have technical problems with our products, please contact the SMA Service Line. We need the following information in order to provide you with the necessary assistance:

- Device type
- Serial number
- Error- and warning messages displayed
- Type of genset control unit used

Danmark Deutschland Österreich Schweiz	SMA Solar Technology AG Niestetal SMA Online Service Center: www.SMA.de/Service Sunny Boy, Sunny Mini Central, Sunny Tripower: +49 561 9522-1499 Monitoring Systems (Kommunikationsprodukte): +49 561 9522-2499 Fuel Save Controller (PV-Diesel-Hybridsysteme): +49 561 9522-3199 Sunny Island, Sunny Backup, Hydro Boy: +49 561 9522-399 Sunny Central: +49 561 9522-299	Belgien Belgique België Luxemburg Luxembourg Nederland	SMA Benelux BVBA/SPRL Mechelen +32 15 286 730
		Česko Magyarország Polska România Slovensko	SMA Central & Eastern Europe s.r.o. Praha +420 235 010 417
France	SMA France S.A.S. Lyon +33 472 22 97 00	Ελλάδα Κύπρος	SMA Hellas AE Αθήνα +30 210 9856666
España Portugal	SMA Ibérica Tecnología Solar, S.L.U. Barcelona +34 935 63 50 99	United Kingdom	SMA Solar UK Ltd. Milton Keynes +44 1908 304899
Italia	SMA Italia S.r.l. Milano +39 02 8934-7299	France	SMA France S.A.S. Lyon +33 472 22 97 00
United Arab Emirates	SMA Middle East LLC Abu Dhabi +971 2 234-6177	India	SMA Solar India Pvt. Ltd. Mumbai +91 22 61713888
ไทย	SMA Solar (Thailand) Co., Ltd. กรุงเทพฯ +66 2 670 6999	대한민국	SMA Technology Korea Co., Ltd. 서울 +82-2-520-2666

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Australia	SMA Australia Pty Ltd. Sydney Toll free for Australia: 1800 SMA AUS (1800 762 287) International: +61 2 9491 4200	Other countries	International SMA Service Line Niestetal Toll free worldwide: 00800 SMA SERVICE (+800 762 7378423)

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